University of Alberta

# Physical Activity of Aboriginals with Type 2 Diabetes: An Exploratory Study

by

Stephanie Brunet

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Science.

Centre for Health Promotion Studies

Edmonton, Alberta

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# University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Physical Activity of Aboriginals with Type II Diabetes: An Exploratory Study submitted by Stephanie Brunet in partial fulfillment of the requirements for the degree of Master of Science.

August 1st, 2003
*Date*

**ABSTRACT**

Type 2 diabetes is a serious public health issue among Aboriginal populations. Physical activity is a key behavioural strategy for the prevention and management of type 2 diabetes. The aims of this study were to: (1) examine the perceived meaning of physical activity amongst Aboriginals with type 2 diabetes; (2) assess physical activity behaviour levels amongst this population; and (3) examine the association of key Social Cognitive Theory (SCT) constructs with physical activity behaviour. Thirty-four Alberta Aboriginals with type 2 diabetes completed a survey comprised of questions related to the three research aims. A key emerging theme from the first aim revealed that leisure-time physical activity is largely perceived to be only for youth. Based on reported energy expenditure estimates, 64.5% were sedentary. Correlational analyses for the third research aim revealed that no SCT constructs were significantly associated with energy expenditure estimates. Implications of these findings are provided along with identification of the lessons learned and the process involved with this form of research with this population.

## DEDICATION

To the Past, Present, and Future, I dedicate this thesis.
To the Past, to the people who have inspired me,
To the Present, to the people who encourage me,
To the Future, to the people who will challenge me to be the best I can be.

## ACKNOWLEDGEMENTS

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**Title: Physical Activity of Aboriginals with Type 2 Diabetes: An Exploratory Study**


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# CHAPTER ONE – INTRODUCTION

## 1.1 Introduction

It is anticipated that by the year 2010, there will be over 220 million people in the world living with diabetes (Zimmet, 2000). Diabetes is the seventh major leading cause of mortality in Canada, contributing to approximately 5500 deaths a year (Health Canada, 1999). The actual number of deaths for which diabetes is a contributing factor is estimated at five times this statistic. Today, over two million Canadians have diabetes, and by 2010 it is expected that this number will grow to over three million (Canadian Diabetes Association [CDA], 2001). While it is widely recognized that type 2 diabetes has become a serious public health problem for the population at large (McGinnis, 2002), prevalence rates are two to six times greater in Aboriginal populations compared to non-Aboriginal populations (Daniel, Rowley, Herbert, O'Dea & Green, 2001; Delisle & Ekoe, 1993; Young, Szathmary, Evers & Wheatley, 1990).

Prior to 1940, diabetes was a rare condition in North American Aboriginals (West, 1974). During the last six decades, however, type 2 diabetes among Aboriginals has progressively risen to epidemic proportions (Horn, Paradis, Potvin, Macaulay & Desrosiers, 2001; Macaulay et al., 1997). High rates of diabetes among Aboriginal people are presumed to be the consequence of environmental changes, genetic susceptibility to diabetes, and cultural transition from traditional to modern ways of living (Knowler, Pettitt, Saad & Bennett, 1990). A series of studies have indicated high and variable prevalence rates of type 2 diabetes in Aboriginal communities across Canada. These rates have tended to be higher in areas of easier access to urban centres (Delisle & Ekoe, 1993; Zimmet, 1995). For example, diabetes prevalence rates of

Aboriginals in the remote northern territories are among the lowest of Canadian Aboriginal groups (Health Canada, 1997). Harris and colleagues (1997) found type 2 diabetes prevalence rates of 36.4% in members aged 30-64 years in Sandy Lake, Ontario. Daniel, Gamble, Henderson, and Burgess (1995) reported a prevalence rate of 5.2% in natives of the Okanogan community. The development of type 2 diabetes among Aboriginal children is also a growing concern (Dean, Young, Flett & Wood-Steinman, 1998; Indian and Inuit Health Committee, 1995; Macaulay, Montour & Adelson, 1988). In the Island Lake region of north-eastern Manitoba, Dean et al. (1998) described a type 2 diabetes prevalence rate of 3.6% among children aged 10-19 years.

Coupled with these high rates of type 2 diabetes are significant health complications. The diabetes literature has established empirical support regarding the complications surrounding this health condition, such as increased risk of: cardiovascular disease, retinopathy, nephropathy, hypertension, and neuropathy (Macaulay et al., 1988; Manitoba Health, 1998; Whiteside, 1994). Rates of complications associated with diabetes are frequently greater in Aboriginal populations. For example, studies have described higher rates of end-stage renal disease (Whiteside, 1994) and ischemic heart disease (Macaulay et al., 1988) among Aboriginals. The Manitoba Government reports its native population accounts for 91% of lower limb amputations, 60% of hospitalizations for heart disease, 50% of hospitalizations for stroke, and 41% of hospital days (Manitoba Health, 1998).

Despite these alarming statistics and significant health complications, there are established mechanisms to reverse the diabetes epidemic – – physical activity is a key behavioural strategy for the prevention and management of type 2 diabetes (Nieman,

1998). Participation in regular physical activity has shown to decrease fasting blood glucose levels and decrease insulin requirements (Kriska, Hanley, Harris & Zinman, 2001). In addition to physical activity's important role in diabetes management and glycemic control, this behaviour confers several psychological benefits (e.g., improved mood and self-esteem, increased sense of well-being, enhanced quality of life) and physiological benefits (e.g., reduced resting pulse rate, reduced cardiac work, decreased low-density lipoprotein concentrations) (Glasgow, Ruggiero, Eakin, Dryfoos & Chobanian, 1997; Lipson, Bonow, Schaefer, Brewer & Lindgren, 1980).

Despite the potential benefits of physical activity, over 57% of Canadians fail to participate in sufficient physical activity to experience its health benefits (Canadian Fitness and Lifestyle Research Institute [CFLRI], 2001). Similar physical inactivity rates have also been reported among the diabetes population (Ford & Herman, 1995; Hays & Clark, 1999). Hays and Clark (1999) found that 54.6% of Americans with diabetes participated in no leisure-time physical activity, with higher inactivity rates (64%) for the oldest age group (70 years and over). Among Aboriginals, one study reported only 43% of Inuits and 38% of Dené participated in physical activity three or more times per week for at least 15 minutes (Imrie & Warren, 1988). Daniel and colleagues (1995) also documented low levels of activity, with only 37% of Aboriginals (Penticton Band, Spallumcheen Band, and Okanogan Band) with diabetes participating in 'sweat producing activities' at least three times a week. In a more recent study on the Sandy Lake Reserve, Kriska and colleagues (2001) reported that men engaged in 6.9 hours of leisure-time activity per week while women only engaged in 1.5 hours a week.

There is a need to examine the meaning of physical activity among different cultures to ensure the development of culturally relevant assessment tools, related physical activity interventions, and program materials (Allison, 1988). Diabetes self-management activities among Aboriginals are deeply rooted in cultural values and beliefs; therefore, it is essential to ensure cultural appropriateness when developing interventions in this population. Behaviour, therefore, can only be fully understood when the cultural context is taken into consideration. There have been few studies that have explored this issue with Aboriginal people (Henderson & Ainsworth, 2000, 2001). Henderson and Ainsworth (2001) examined how Native women perceived physical activity across their lifespan. Through interviews, the researchers noted that participants commonly defined physical activity in terms of daily tasks such as: household, childcare, and work-related tasks. In another study, Henderson and Ainsworth (2000) explored the sociocultural perspectives of physical activity in the lives of older American Aboriginal women of the Pueblos and Navajo Nation of New Mexico. An emerging theme from the study's interviews was the value of physical activity instilled in several of their traditions (e.g., the physical activity in dancing), and the emphasis on work-related physical activity. In order for health professionals to effectively change behaviour, Henderson and Ainsworth (2000, 2001) emphasize the importance of examining the sociocultural meaning of physical activity.

To intervene effectively on health promoting behaviours (e.g., physical activity), scholars and health professionals have focused much of their efforts on understanding the process of individual behaviour change. In recent years, several theories and models (e.g., Protection Motivation Theory, Theory of Planned Behaviour, Social Cognitive

Theory (SCT), Transtheoretical Model, Health Belief Model) from social psychology have been proposed (Maddux, 1993). While there have been some attempts at testing social-cognitive theories among Aboriginals with diabetes in the physical activity domain, these studies have been limited to examining specific theoretical constructs rather than employing complete theories (Eyler et al., 1999; Harnack, Story & Rock, 1999; Stolarcyzk et al., 1999). For example, Eyler et al. (1999) assessed the association of physical activity with social support among middle- and older-aged American Aboriginal/Alaskan Native women. In another study, Harnack et al. (1999) examined barriers to regular physical activity in Lakota adults residing on South Dakota Reserves. Knowledge and attitudes regarding physical activity were explored among Native Americans with diabetes (Stolarcyzk et al., 1999). In sum, these studies provide support that certain social-cognitive theory constructs (i.e., social support, barriers, knowledge, attitudes) may potentially be associated with physical activity behaviour in this target population. Because the constructs from these studies are primarily from SCT, this theory may have merit in understanding physical activity behaviour change among Aboriginals with diabetes.

SCT holds that ten constructs (i.e., self-efficacy, behavioural capability, observational learning, outcome expectancies, outcome expectations, environment, situation, self-control, emotional coping responses, and reinforcements) be used to understand, predict, and change behaviour. A key principle of SCT is reciprocal determinism where human behaviour is defined as a triadic, dynamic, and reciprocal interaction of personal, behavioural, and environmental factors that operate bi-directionally as interacting determinants (Bandura, 1977, 1986). The person-behaviour

interaction entails the bi-directional influences of an individual's emotions, cognitions, thoughts, and biological properties (e.g., sex, ethnicity, and genetic predisposition) with one's actions (Bandura, 1986). Furthermore, these cognitions may change over time with maturation and experience. In the environment-person interaction, human expectations, beliefs, and cognitive competencies are developed and modified by the social (e.g., modelling, instruction, and social support) and physical environments. The behaviour-environment interaction posits that the individual's behaviour will influence which environmental factors they are exposed to, and the environment in turn will modify the individual's behaviour.

Within the general population, the literature has provided significant evidence supporting the association and predictive ability of various SCT constructs in the physical activity domain (Booth, Owen, Bauman, Clavisi & Leslie, 2000; Ewart, Stewart, Gillian & Kelemen, 1986; Garcia & King, 1991; Sallis, Haskell, Fortmann, Vranizan, Taylor & Solomon, 1986; Sallis, Hovell, Hofstetter & Barrington, 1992; Schuster, Petose & Petosa, 1995). Support for the SCT in Aboriginal communities (e.g., Kahnawake and Hawaii) has also emerged in a variety of community-based projects (Macaulay et al., 1997; Mau et al., 2001). These studies operationalized various elements of the SCT. For example, self-efficacy and modelling were incorporated in a primary prevention project for non-insulin dependent diabetes (Macaulay et al., 1997). The study's findings suggest that increased physical activity participation may be attributed to the operationalization of SCT constructs.

## 1.2 Overall Rationale for the Study

This study is significant because of the serious diabetes epidemic among Canadian Aboriginals, and the corresponding need to develop physical activity interventions. As described in the literature, the focus on physical activity is supported by its potential role in preventing and managing diabetes. Furthermore, this study reflects urgent calls in the literature to develop effective strategies for Aboriginal people living with diabetes (Daniel & Gamble, 1995). One potential strategy is the implementation of physical activity interventions based on social-cognitive theories (e.g., SCT). The SCT has been supported in a variety of studies across a broad range of behaviours and populations (Booth et al., 2000; Ewart et al., 1986; Garcia & King, 1991; Sallis et al., 1986; Sallis et al., 1992; Schuster et al., 1995). To date, however, researchers have not examined the SCT for its applicability in physical activity promotion among Canada's Aboriginals with diabetes. Given the uniqueness of this specific population's culture and values, findings from existing SCT research conducted in the general population cannot be generalized to Aboriginal populations. It is, therefore, necessary that research be undertaken to: (1) examine the perceived meaning of physical activity amongst Aboriginals with type 2 diabetes (Research Aim One); (2) assess the levels of physical activity behaviour amongst Aboriginals with type 2 diabetes (Research Aim Two); and (3) test the association of key SCT constructs with physical activity behaviour amongst Aboriginals with type 2 diabetes (Research Aim Three). The specific research questions and hypotheses of these study aims are presented at the end of the Literature Review Chapter (Chapter Two).

## 1.3 Plan of Thesis

As classified by the guidelines set by the Faculty of Graduate Studies and Research, and the Centre for Health Promotion Studies at the University of Alberta, this thesis is a mixed paper format. It is to be noted, the reader should expect overlap between the chapters because of the thesis format. Following this Introductory Chapter, Chapter Two will present a review of the literature detailing: Aboriginal culture; physical activity and diabetes; physical activity among Aboriginal people (i.e., perceived meaning and actual behaviour levels); SCT constructs; SCT interventions; measurement (i.e., SCT constructs and physical activity behaviour); other physical activity correlates; and dissemination strategies. The Literature Review Chapter is followed by a manuscript (Chapter Three) addressing the research aims of this thesis, which includes its own specific introduction, methods, results, and discussion section. The manuscript will be succeeded by the Conclusion Chapter (Chapter Four) and an appended Methods Chapter detailing the study methods.

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# CHAPTER TWO – LITERATURE REVIEW

## Overview of the Chapter

*Chapter One provided an overview regarding the magnitude of the diabetes epidemic in Aboriginal populations, the perceived meaning of physical activity and behaviour levels among Aboriginal populations, and introduced the Social Cognitive Theory (SCT). This chapter will elaborate on these topics in six main sections. The first section provides context regarding: (1) Aboriginal culture; (2) physical activity and diabetes; and (3) physical activity among Aboriginal people (i.e., perceived meaning and actual behaviour levels). Section two gives an extensive review of the SCT literature, highlighting research that has examined SCT constructs and interventions with a primary focus on the physical activity domain. The third section addresses measurement regarding SCT constructs and physical activity. The fourth section describes other physical activity correlates. Section five highlights the importance of dissemination strategies for this population. The chapter concludes with the research aims, specific research questions, and hypotheses to be addressed.*

## 2.1 Context

### 2.1.1 Aboriginal Culture

The terms 'Aboriginal' or 'First Nation' refer to a decent of people, prior to the arrival of Europeans, who inhabited the territory now called Canada for thousands of years. A variety of lifestyles, languages, and histories distinguish Aboriginal communities across Canada. Anthropologists generally recognize six Canadian Aboriginal categories, including: Woodland, Iroquoian, Plateau, Aboriginals of the

Mackenzie, Yukon River Basins, Aboriginals of the Pacific Coast, and Plains. The Plains Aboriginals which include the Blackfoot, Blood, Chipwyan, Cree, Dené, Stoney, and Sarcee are geographically located in the province of Alberta, and constitute three Treaty areas (i.e., Treaty 6, Treaty 7, Treaty 8) comprising 105 Reserves. These Reserves are areas of land that were set aside, and held in trust for the Native people of Canada after Confederation. Most of these Treaties included agreements for schooling, agricultural equipment, agriculture training, gifts, and annuities. Today, many of these Reserves have similar services (e.g., running water, electricity) as other rural communities in Alberta. Currently, many Aboriginals live on Reserves; however, for various reasons (e.g., employment, education) some Aboriginals reside temporarily or permanently in urban centres.

Historically, the Plains Aboriginals had a nomadic lifestyle, travelling distances to trade and hunt. Over the past 50 years, the environments and lifestyles (e.g., readily accessible high calorie and high fat foods, modernization of transportation) of Aboriginal people have changed considerably (Harris et al., 1997). This has resulted in many medical health threats, including diabetes. Diabetes was not detected among Aboriginal people until the 1940s (West, 1974). Today, however, alarming rates of diabetes among Aboriginals are being reported around the world (Young, Reading, Elias & O'Neil, 2000; Zimmet, 1995). High prevalence rates are reported among the Pima Indians who show a rate of 49.8% among those thirty-five years and older (Knowler, Bennett, Hamman & Miller, 1978). Harris and colleagues (1997) found type 2 diabetes prevalence rates of 36.4% in members aged 30-64 years in Sandy Lake, Ontario. Daniel, Gamble, Henderson, and Burgess (1995) documented prevalence rates of 5.2% in natives from the

Okanogan community (British Columbia). Furthermore, there is a growing concern regarding the development of type 2 diabetes among North American Aboriginal children (Dabalea et al., 1998; Dean, Young, Flett & Wood-Steinman, 1998; Indian and Inuit Health Committee, 1995; Macaulay, Montour & Adelson, 1988). Dean et al. (1998) reported a type 2 diabetes prevalence rate of 3.6% among children aged 10-19 years in the Island Lake region of north-eastern Manitoba. Dabalea et al. (1998) described similar prevalence rates (3.78% for boys 15-19 years; 5.31% for girls 15-19 years) among Pima Aboriginal children.

### 2.1.2 Physical Activity and Diabetes

The literature documents that physical activity is a key behavioural strategy for the prevention and management of type 2 diabetes (Nieman, 1998). There are numerous potential benefits for engaging in physical activity among those with diabetes (Horton, 1988; Nieman, 1998). Physical activity is frequently prescribed to help improve insulin resistance and as an adjunct to healthy diets (Horton, 1988). In addition, regular physical activity improves several cardiovascular disease risk factors, such as decreases in low-density lipoproteins concentrations (Lipson, Bonow, Schaefer, Brewer & Lindgren, 1980). Other benefits include decreases in resting heart rate and cardiac work (Carter, Banister & Blaber, 2003). Regular physical activity also leads to several psychological benefits including: increased sense of well-being, improved self-esteem, and enhanced quality of life (Glasgow, Ruggiero, Eakin, Dryfoos & Chobanian, 1997).

Despite the numerous known benefits of physical activity, it is important for health professionals planning physical activity interventions for people with diabetes to be aware of potential risks. For example, vigorous physical activity may increase the risk

of developing retinal and vitreous haemorrhages and retinal detachment for those with proliferative retinopathy (Horton, 1988). Furthermore, physical activity may lower insulin resistance, and may result in hypoglycaemia during physical activity or up to 48 hours following participation (Flood & Constance, 2002).

Physical activity prescription in the diabetes population is based on the consideration that benefits outweigh risks. Physical activity guidelines recommended to the diabetes population are similar to those promoted for the general population. Before participating in physical activity, however, there are special precautions that individuals with diabetes must be aware of to reduce the potential risks described earlier. For example, individuals should complete a medical examination, as there is a high prevalence of silent ischemic heart disease in those with type 2 diabetes. If the individual is taking insulin, blood glucose levels should be monitored before, during, and after activity. Feet should also be inspected after physical activity and daily activities.

### 2.1.3 Physical Activity among Aboriginal People

In light of the benefits of physical activity for those with diabetes, it is important from a public health perspective to be aware of the proportion of people meeting the physical activity guidelines and the factors influencing this behaviour. In recent years, research on physical activity patterns in Aboriginal communities has emerged. Fisher et al. (1999) explored physical activity patterns in Chippewa and Menominee Aboriginals, and reported that 12.2% of women and 16.6% of men were regularly active within the last 7-12 months. Furthermore, 33.0% of women and 20.8% of men reported no leisure-time physical activity. The authors conclude that although the prevalence of leisure-time inactivity was higher than national health objectives, participants accrued sufficient

amounts of physical activity when occupational and household activities were considered.

The significant contribution of occupational activities has also been noted in other studies (Ainsworth, Irwin, Addy, Whitt & Stolarczyk, 1999; Kriska, Hanley, Harris & Zinman, 2001). For example, Kriska et al. (2001) explored physical activity patterns in Native Canadians residing in Sandy Lake, Ontario. The researchers concluded that the contribution of occupational activities was greater than leisure-time physical activities among the 530 community members surveyed.

Ainsworth et al. (1999) made similar conclusions in their examination of physical activity patterns in Native American women. These researchers analyzed four-day physical activity records completed on non-consecutive months over a six-month period. The researchers reported between 55% and 65% of the women met the physical activity recommendations (i.e., moderate intensity on most days of the week) outlined by the Centers for Disease Control and Prevention, and the American College of Sports Medicine (CDC-ACSM) (Pate et al., 1995). The reported prevalence rates included occupational, household, and childcare related activities. However, fewer than 25% of Native American women participated in conditioning and sports activities.

The studies described above have examined physical activity levels; however, little research has: (1) focused on the perceived meaning of "physical activity" in Aboriginal communities; and (2) determined whether this meaning is congruent with the Western view of this term. Over a decade ago, there was a call for an examination of the perceptions of physical activity among different cultures (Allison, 1988). Since then, only a few studies exploring this issue with Aboriginal people have emerged (Henderson

& Ainsworth, 2000, 2001). Through interviews, Henderson and Ainsworth (2001) explored how Native women perceived physical activity across their lifespan. Their definitions were primarily divided into two themes: (1) moving; and (2) exercising. In regards to the term moving, the researchers noted participants commonly defined physical activity in terms of daily tasks such as: household, childcare, and work-related tasks. Fewer than half of the women described physical activity in terms of 'exercising' (i.e., sports and conditioning activities). Given the limited definition of 'physical activity' among the Aboriginal participants, the authors highly recommend the need for education to expand Native women's repertoire of physical activity opportunities (Henderson & Ainsworth, 2000, 2001).

Henderson and Ainsworth (2000) explored the sociocultural perspectives of physical activity in the lives of older American Aboriginal women from the Pueblos and Navajo Nation of New Mexico. In the interviews, women were asked, "How does being Native American affect your physical activity?". Although many of the women denied their race (i.e., shared physical characteristics), ethnicity (i.e., group's customs, language, or social views), and culture (i.e., customary beliefs and social forms) made a difference in their perception of physical activity, the researchers suggested that these issues influenced the participants' perceptions more than the participants indicated. Some women expressed feelings of marginality, such as lack of recreational resources and the amount of work for pay. Despite this marginalization, several women described feelings of cultural pride. The value of physical activity was described as being integrated in several of their traditions (e.g., physical activity in dancing).

There is also evidence suggesting cultural differences in the types of activity involvement (Harris, Begay & Page, 1989). For example, a study of 128 American Aboriginal, Anglo, and Hispanic adults reported that Aboriginal women spent more time 'sitting around' than Anglos. Alternatively, this study also revealed a pattern of significantly greater involvement in childcare and volunteer work among Aboriginals than Hispanics and Anglos.

These studies demonstrate that if health professionals are to effectively change behaviour, it is essential that they examine the sociocultural meaning of physical activity. Although studies examining the perceptions of physical activity among Aboriginal women are beginning to surface (Eyler et al., 1998; Henderson & Ainsworth, 2000, 2001), there is a dearth of comparable research among Aboriginal men. Further investigation on the meaning of physical activity is required to ensure the development of culturally relevant assessment tools, related physical activity interventions, and program materials for Aboriginal groups.

In interviews with older American Aboriginal females from the Pueblos and Navajo Nation of New Mexico, the women described the challenges they faced with public health physical activity recommendations (Henderson & Ainsworth, 2000). For example, it was customary for many American Aboriginals not to use watches; therefore, making prescripted duration of physical activity irrelevant in their context since attention is not focused on time.

The studies described in this section have focused on a small segment of North American indigenous tribes. Researchers must be aware that within a large cultural group there are often smaller groups which may have highly diverse traditions (Cousins,

1999). Therefore, generalizations regarding physical activity behaviour and perceptions should be developed cautiously.

## 2.2 The Social Cognitive Theory

Given the high prevalence of diabetes among Aboriginals, their low physical activity levels, and the critical role physical activity plays in the management of diabetes, it is imperative that research be undertaken to understand how to best promote physical activity participation among Aboriginals with diabetes in a culturally appropriate way. In order to intervene effectively, scholars and health professionals have focused their efforts on understanding how individuals change their volitional behaviour. In recent years, several theories originating in social psychology have been proposed. For example, studies have supported the association of physical activity with various social-cognitive theories, such as: Protection Motivation (Plotnikoff & Higginbotham, 1995), Theory of Planned Behaviour (Courneya, Plotnikoff, Hotz & Birkett, 2001), SCT (Booth, Owen, Bauman, Clavisi & Leslie, 2000), Transtheoretical Model (Plotnikoff, Hotz, Birkett & Courneya, 2001), and Health Belief Model (Oldridge & Streiner, 1990). To date, the application of such theories has yet to be examined with Aboriginal populations. However, there is some support for specific social-cognitive constructs (i.e., social support, barriers, knowledge, and attitudes) from studies conducted with Aboriginal communities regarding physical activity (Eyler et al., 1999; Harnack, Story & Rock, 1999; Stolarcyzk et al., 1999). Because the constructs from these studies are primarily from the SCT, this theory may have merit for understanding physical activity behaviour of Aboriginals. Moreover, the SCT has successfully been tested and applied to a number

of health behaviours, including heart disease management (Ewart, Stewarter, Gillian & Keleman, 1986), dietary fat reduction (Anderson, Winett & Wojkok, 2000), alcohol consumption (Lang & Strizke, 1993), and physical activity (Booth et al., 2000; Sallis et al., 1989; Weiss, McCullagh, Smith & Berlant, 1998).

SCT was originally named the Social Learning Theory (SLT); however, in 1986 Bandura renamed SLT to distinguish it from other social-learning theories. SCT attempts to understand, predict, and change volitional behaviour using several key constructs, including: self-efficacy, behavioural capability, observational learning, outcome expectancies, outcome expectations, environment, situation, self-control, emotional coping responses, and reinforcements. For the purposes of this literature review, the explanation of SCT provided by Baranowski, Perry, and Parcel (1996) was selected for two main reasons: (1) several classic SCT studies in the physical activity domain have used the constructs of this interpretation (Booth et al., 2000; Sallis et al., 1989; Schuster, Petose & Petosa, 1995); and (2) Baranowski et al. (1996) have operationalized the constructs for theory-driven health promotion interventions.

### 2.2.1 Reciprocal Determinism

Bandura (1986) identified the role of cognitive, vicarious, self-regulatory, and self-reflective processes in human adaptation and change. Bandura recognized that individuals are self-organizing, proactive, self-reflecting, and self-regulating agents rather than reactive organisms shaped by environmental forces or driven by concealed inner impulses. From this theoretical perspective, human functioning is viewed as the product of a dynamic, triadic, and reciprocal interplay of personal, behavioural, and environmental influences. This notion of interplay is labelled "reciprocal determinism"

which is the interaction between three factors: the individual, the specific behaviour being examined, and the environment in which the behaviour occurs (Bandura, 1986). The principle of reciprocal determinism is schematically illustrated in Figure 2.1. Reciprocal determinism recognizes the interaction between the three factors occurs bi-directionally, thus a change in one factor has implications on the other factors (Bandura, 1977, 1986). Furthermore, SCT acknowledges the magnitude of the influence of these factors differs, and these factors may not act simultaneously. Within SCT, reciprocal determinism is regarded as a principle; therefore, it is not submitted to empirical testing (Baranowski et al., 1996).

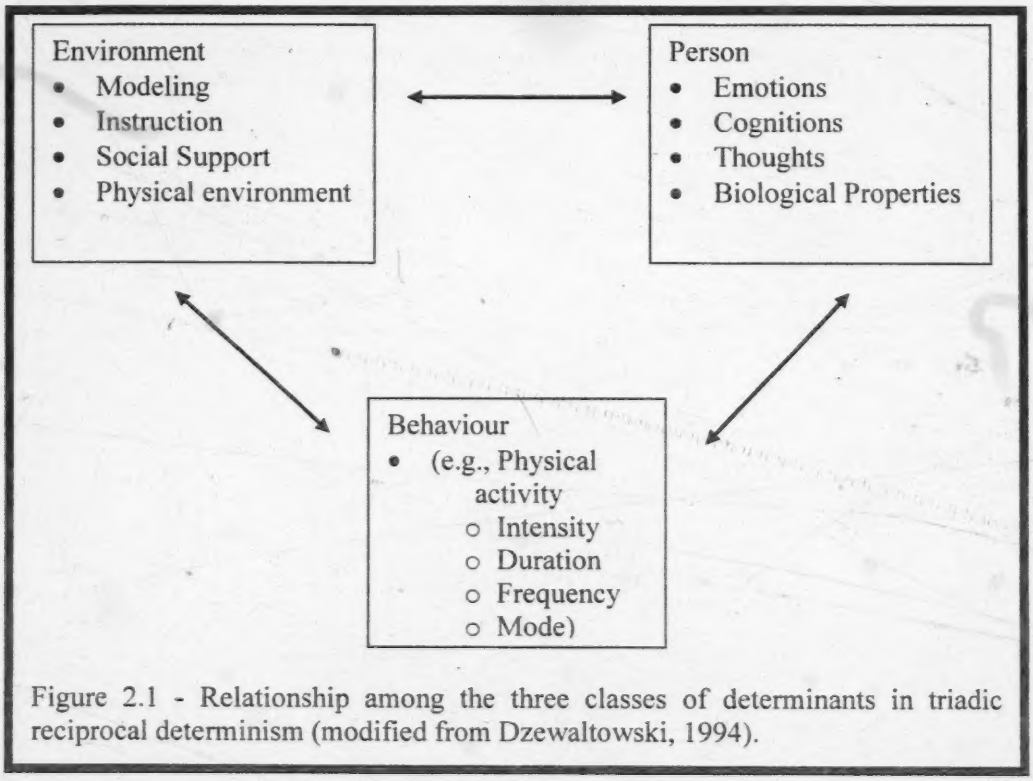


Figure 2.1 - Relationship among the three classes of determinants in triadic reciprocal determinism (modified from Dzewaltowski, 1994).

The person-behaviour interaction entails the bi-directional influences of an individual's emotions, thoughts, biological properties (e.g., sex, ethnicity, and genetic predisposition), and one's actions (Bandura, 1986). For example, individual personal factors (e.g., expectations, capacity to symbolize behaviour, confidence in performing a behaviour, ability to reflect and analyze the experience, beliefs, self-perceptions, goals, and intentions) all give shape and direction to behaviour. In turn, the performed behaviour will then affect the individual's cognitive and bio-medical (e.g., weight and appearance) properties.

A second interaction occurs between the environment and one's personal characteristics (Bandura, 1986). In this interaction, the social (e.g., modelling, instruction, and social support) and physical environments are developed and modified by human expectations, beliefs, and cognitive competencies. Further, individuals with different physical characteristics, such as age, size, race, sex, and physical attractiveness evoke different responses from their social and physical environments.

A third interaction occurs between behaviour and the environment. SCT holds that people are both products and producers of their environment (Bandura, 1986). An individual's behaviour will determine which of the many potential environmental influences he/she are exposed to, and that environment in turn will modify their behaviour.

*The following subsections: (1) define the SCT constructs, and examine the collective results of studies that have examined the association of SCT's constructs (i.e.,*

*through descriptive, correlational, and longitudinal designs) of self-efficacy, behavioural capability, observational learning, outcome expectancies, outcome expectations, environment, situation, self-control, emotional coping responses, and reinforcements with physical activity behaviour; and (2) assesses the efficacy of SCT physical activity interventions. Where literature is available, these constructs are reported: (i) within the general population; (ii) within the diabetes population; and (iii) within the Aboriginal population both with and without diabetes.*

### 2.2.2 Social Cognitive Theory Constructs

Baranowski et al. (1996) describes ten constructs (Bandura, 1977, 1986) that form the basis of the SCT, they include: self-efficacy, behavioural capability, observational learning, outcome expectancies, outcome expectations, environment, situation, self-control, emotional coping responses, and reinforcements (see Table 2.1).

**Table 2.1 – Definitions of Social Cognitive Theory Constructs**

| Construct | Definition |
|---|---|
| Self-efficacy | An individual's confidence in performing a behaviour |
| Behaviour Capability | Knowledge and skill to perform a behaviour |
| Observational Learning | Acquisition of a behaviour that occurs by observing the actions and outcomes of others' behaviour |
| Outcome Expectancies | The value given to the outcome |
| Outcome Expectations | Anticipated outcomes for performing a specific behaviour |
| Situation | Individual's perception of the environment |
| Self-control | Individual regulation of goal-directed behaviour |
| Emotional Coping Responses | Techniques used by an individual to deal with emotional stimuli |
| Reinforcement | Responses that increase or decrease likelihood of reoccurrence |

*Self-Efficacy*

One of the pivotal constructs of SCT is the individual's self-efficacy beliefs. Self-efficacy refers to beliefs in one's capabilities to organize and carry out courses of action required to attain specific levels of behaviour. It has been suggested that self-efficacy is a fundamental determinant of behavioural change given its important role in framing how much effort people will expend on an activity (Bandura, 1986). In the absence of the efficacy belief, the individual has little incentive to act.

The role of self-efficacy in the initiation and maintenance of health behaviours has been firmly established. Evidence acknowledging that higher self-efficacy is associated with the participation and maintenance of health behaviours has been drawn from the results of studies across a variety of behaviours, including: disease management (Clark & Dodge, 1999), breast cancer screening (Lechner, de Vries & Offermans, 1997), and fruit and vegetable consumption (Brug, Lechner & de Vries, 1995). In the physical activity domain, several major studies (Booth et al., 2000; Dzewaltowski, Noble & Shaw, 1990; Ev[illegible]t et al., 1986; Garcia & King, 1991; Plotnikoff, Brez & Brunet, in press; Plotnikoff, Brez & Hotz, 2000; Plotnikoff et al., 2001; Sallis, Hovell, Hofstetter & Barrington, 1989; Sallis et al, 1992; Schuster et al., 1995; Wallace, Buckworth, Kirby & Sherman, 2000) have reported those with greater self-efficacy tend to participate more frequently in physical activity and maintain this healthy behaviour.

In regard to those living with diabetes, the literature has also established self-efficacy as an important factor in self-management adherence activities (Padgett, 1991; Senecal, Nouwen & White, 2000). Senecal et al. (2000) examined dietary self-efficacy

of 638 members of the Quebec Diabetes Association. This study reported that self-efficacy made independent contributions to the prediction of dietary self-care behaviours. Their findings have clear implications for including self-efficacy in future interventions to promote self-management adherence.

A second empirical study containing a subsample of 46 adults with type 1 or type 2 diabetes residing in the Regional Municipality of Ottawa-Carleton (Ontario) investigated predictors of physical activity behaviour (Plotnikoff et al., 2000). This study revealed that self-efficacy significantly predicted energy expenditure in a six-month follow-up. Indeed, self-efficacy was the strongest predictor of physical activity behaviour of 12 social-cognitive constructs examined in the study.

*Behavioural Capability*

Embedded in the SCT is the behavioural capability construct. The behavioural capability construct posits that it is essential for the individual to know what the behaviour is (i.e., knowledge) and how to perform it (i.e., skill). An individual's behavioural capability is the product of his/her personal training, intellectual capacity, and learning style (Baranoswki et al., 1996). It is, therefore, important for the individual to be clear on the targeted behaviour. If a person with diabetes lacks the awareness of how physical activity may help manage their diabetes, he/she will have little reason to change unhealthy behaviours. For instance, those with diabetes must be aware of what physical activity is appropriate (mode, duration, frequency, intensity), and how to perform these activities safely.

There has been little research documenting the construct of behavioural capability's (i.e., knowledge and skill) capacity to predict and discriminate physical

activity behaviour. In the physical activity domain, studies have primarily examined the knowledge component of this construct (Rimal, 2001; Sallis et al., 1989). These particular studies have shown a positive association between physical activity and knowledge.

A body of literature exists regarding the relationship between physical activity and knowledge in those with diabetes (Coates & Boore, 1998; Stolarcyzk et al., 1999; Wilson et al., 1986). A consistent conclusion in these studies is that knowledge is an important influence on self-management behaviours in the diabetes population. One of these studies (Wilson et al., 1986) examined information and the ability to apply knowledge in relation to four diabetes self-care behaviours (i.e., taking medication, glucose testing, diet, and exercise) of 184 people with type 2 diabetes. The researchers reported that knowledge significantly enhanced the ability to predict all four self-care behaviours among the sample.

Investigation on the knowledge component of the behaviour capability construct has also been examined among indigenous people with diabetes (Stolarcyzk et al., 1999). Stolarcyzk and colleagues (1999) interviewed Native Americans living with diabetes residing in Rio Grande Pueblo communities to determine their perceptions on physical activity outcomes. Results indicated that residents of the Rio Grande Pueblo community were unaware of the benefits of physical activity in relation to diabetes prevention and management. These results support the need for educational programs to enhance the awareness of physical activity's benefits.

*Observational Learning*

Observational learning plays a role in SCT, and is described as the process "whereby observers transform visually modelled events into symbolic codes which are collectively rehearsed for later retrieval" (Adams, 2001, pp. 68). In other words, observations are coded and subsequently used to form rules and guide action for a specific behaviour. Since the individual learns approximately what to do through the modelling process, he/she is spared the consuming process time of trial and error. In addition, observational learning fosters actual behaviour; the learner becomes aware of the reinforcements and consequences of the specific behaviour.

Evidence that behaviours can be learned through observational learning has been drawn from studies involving a variety of behaviours, including: alcohol consumption (Lang & Stritzke, 1993), dietary fat reduction (Anderson et al., 2000), heart disease management (Clark & Dodge, 1999), and physical activity (Booth et al., 2000; Pollack & Lee, 1992; Sallis et al., 1989; Weiss, McCullagh, Smith & Berlant, 1998).

A study completed by Booth et al. (2000) examined observational learning of physical activity among a sample of 449 older adults. Respondents were asked to report the frequency with which they saw others (e.g., neighbours, friends, and family) participate in physical activity. The study reported that having friends or a partner who were physically active was significantly associated with one's own physical activity participation.

Bandura (2002) further points out that although social modelling is a universal human capacity, its use varies in different cultural milieus. Current SCT literature has not examined the efficacy of observational learning with Aboriginals. It is anticipated,

however, that observational learning plays an important role among Aboriginals due to their cultural traditions of visual learning. The preference for visual learning in this population is well documented (More, 1987; Sawyer, 1991). For example, More (1987) conducted a series of interviews with Aboriginals and teachers, and found that learning in traditional native cultures often centres on a watch-then-do approach. Kaulback (1984) attributes the visual preference to child rearing practices that emphasize observation and imitation. Further, Brant (1990) argues that Aboriginals learn more effectively through visionary rather than auditory techniques. The visual orientation of natives appears to be somewhat similar to the observational learning construct in the SCT.

*Outcome Expectancies and Expectations*

Outcome expectancy is described as the value that an individual places on a behaviour's outcome. 'Outcome expectations' are different from 'outcome expectancies'. Outcome expectations are the expected outcomes in response to behaviour. Current research in the physical activity domain has focused on the expectation construct (Sallis et al., 1989; Schuster et al., 1995). Bandura (1998) describes three major forms of outcome expectations (i.e., physical effects, social sanctions, and reactions). The physical effects include pleasant sensory experiences, physical pleasures, discomfort, pain, and unpleasant physical experiences. The second class of outcomes concerns positive and negative social sanctions. The positive and negative reactions to one's behaviour constitute the third class of outcomes. These three forms may be experienced positively as incentives or negatively as disincentives.

Baranowski et al. (1996) describe four ways outcome expectations may be learned: "(1) from previous experiences, (2) from observing others in similar situations

(vicarious experience), (3) from hearing about similar situations from other people or social persuasion, and (4) from emotional or physical responses to behaviours (physiological arousal)" (pp.163).

The literature has frequently examined outcome expectations in the form of perceived benefits and barriers in relation to a health behaviour outcome (Sallis et al., 1989; Schuster et al., 1995). Expectations in the form of perceived benefits and barriers have been shown to be correlated with physical activity (Sallis et al., 1989; Sallis et al., 1992; Schuster et al., 1995). Support has been drawn from Schuster and colleagues' (1989) study with post-retirement adults in which strong correlations with perceived barriers (r=-0.42) and perceived benefits of exercise (r=0.51) were reported.

*Environment and Situation*

Embedded in SCT is the role of environmental factors. The environment provides opportunities, consequences, and feedback to health-behaviours. Environmental components are described as the external factors that may influence behaviour (Baranowski et al., 1996). Baranowski et al. (1996), however, make a distinction between the perceived environment (i.e., termed situation) versus the objective environment (i.e., termed environment). Although labelled as the environment, research has frequently studied the cognitive or mental representations of the environment (i.e., situation; Booth et al., 2000; Jakicic, Wing, Butler & Jeffery, 1997; Sallis & Hovell, 1990; Stolarcyzk et al., 1999). To date, there has been little research investigating the relationship between the perceived and objective environment. Fein, Plotnikoff, Wild and Spence (under review) examined the relationship between perceived and objective environments in the physical activity domain among high-school students in Alberta.

The congruency between the perceived and objective environment assessment, led the authors to conclude that perceptual measures may be a valid assessment of the objective environment.

Additionally the environment may be categorized in terms of its social and physical dimensions. The social environment may include one's spouse, family members, friends, and community. The physical environment typically includes characteristics of the natural environment (e.g., weather and geography) and constructed environment (e.g., walking/biking trails, recreational areas, and transportation). The relationship of the social (Booth et al., 2000; Sallis et al., 1989; Schuster et al., 1995; Stahl et al., 2001; Wallace et al., 2000) and physical (Booth et al., 2000; Jakicic et al., 1997; Sallis et al., 1990; Stolarcyzk et al., 1999) environments with physical activity behaviour has been well established in the literature. Social and physical environmental factors have emerged as correlates and predictors of physical activity behaviour across a variety of settings (Trost, Owen, Bauman, Sallis & Brown, 2002).

Current literature has recognized various social environmental dimensions reported to be associated with physical activity. For example, support from one's spouse (Wallace, Raglin & Jastremski, 1995), friends (Booth et al., 2000; Sallis et al., 1989; Sallis et al., 1992; Wallace et al., 2000), family (Booth et al., 2000; Sallis et al., 1992; Wallace et al., 2000), school peers (Stahl et al., 2001), and workplace peers (Stahl et al., 2001) have all reported a relationship with physical activity.

One of the supporting studies (Booth et al., 2000) examined 449 Australian adults aged 60 and older. The social environment was assessed by the frequency with which family and friends: (1) took over chores to allow an individual to be active; (2)

encouraged him/her to be active; (3) offered to participate in an activity with him/her; and (4) gave helpful reminders. The researchers described that active participants received significantly more support and encouragement from their friends and family than people with fewer social networks.

Investigation of the social environment of those living with diabetes has also shown support for the associations between physical activity and the social environment (Wilson et al., 1986). Wilson and colleagues examined social support in 208 individuals with diabetes in Lane County, Oregon. Social support was studied in the context of: (1) perceived availability of someone to talk with; (2) perceived availability of people to do things with; (3) perceived availability of material aid; and (4) availability of praise from others. Social support was examined in relation to the performance of four diabetes self-care behaviours (i.e., taking medications, following dietary requirements, testing glucose, and physical activity). Wilson and colleagues (1986) reported that social support was moderately correlated with all these self-care behaviours, with Pearson correlations (r) ranging from 0.15 to 0.27.

Eyler and colleagues (1999) examined social support in 738 middle- and older-aged American Aboriginal/Alaskan Native women. Social support was studied in the context of: (1) receiving encouragement; and (2) availability to commit to engaging in physical activity, from friends, relatives, and general. As the researchers hypothesized, those who were sedentary were more likely to have fewer physical activity social support networks.

A body of literature also exists recognizing the association of the physical environment with physical activity behaviour (Booth et al., 2000; Jakicic et al., 1997;

Sallis et al., 1990; Stolarcyzk et al., 1999). Several of these studies have focused on diverse environmental aspects, such as the presence of home equipment (Booth et al., 2000; Jakicic et al., 1997), distance to exercise facilities (Sallis & Hovell, 1990), safety (Booth et al., 2000; Stolarcyzk et al., 1999), and access to facilities (Booth et al., 2000; Stolarcyzk et al., 1999). A consistent conclusion of these studies is that the physical environment has a significant relationship with physical activity behaviour.

Preliminary support for the importance of the environment in the promotion of physical activity behaviour has also emerged from studies with Aboriginal people living with diabetes. Native Americans of New Mexico with diabetes commented on how the "lack of access to aerobics classes (e.g., no transportation or lack of availability in the community), safety issues (e.g., loose dogs, no bike or pedestrian paths away from traffic), or lack of childcare" influenced their physical activity participation (Stolarcyzk et al., 1999, pp. 66). In another study, surveys collected from Lokota adults residing on a Reserve in South Dakota noted similar issues with their environment (e.g., lack of facilities, weather, and safety) which they claimed influenced their physical activity behaviours (Harnack et al., 1999).

*Other Constructs*

Other SCT constructs (i.e., self-control, emotional coping responses, and reinforcement) have received little attention and have not been operationalized in the physical activity literature. The self-control construct refers to the regulation of goal-directed behaviour (Baranowski et al., 1996). The emotional coping construct is described as the use of behaviours as strategies to deal with emotional stimuli. The third

construct is that of reinforcement, defined as a positive or negative response to a behaviour that influences the likelihood of the behaviour being performed again.

*The previous sub-section highlighted the literature regarding the SCT constructs in the physical activity domain. The collective results of these studies suggest that self-efficacy, behavioural capability, observational learning, outcome expectation, and the environment may influence or are associated with physical activity participation. The following sub-section examines SCT interventions to date in: (1) the general community; (2) those with diabetes; and (3) Aboriginals with and without diabetes. The interventions focus on physical activity; however, where applicable other related behavioural interventions (e.g., healthy eating) for those with diabetes are described.*

### 2.2.3 Social Cognitive Theory Interventions

As previously described, a significant proportion of the population is not active enough to receive health benefits. The hope of increasing physical activity levels and other health promoting behaviours lies in the development of efficacious interventions and effective programs. Research findings may assist in the development of successful health promoting interventions and programs to modify and maintain health behaviours. Researchers and health professionals have designed SCT-based interventions to influence behaviour change. Such interventions have addressed a variety of behaviours, such as: sexual HIV risk behaviours (Anonymous, 2001), healthy eating behaviours (Anderson, Winett, Wojcik, Winett & Bowden, 2001; Brug, Steenhuis, van Assema & de Vries,

1996; Miller, Edwards, Kissling & Sanville, 2002), and physical activity behaviours (Hallem & Petosa, 1998; Macauley et al., 1997; Mau et al., 2001).

In the physical activity domain, interventions using the SCT framework have been successful (Hallem & Petosa, 1998). In a workplace SCT intervention, Hallem and Petosa (1998) randomly assigned employees to a control group (n=38) or to an intervention group (n=48). The intervention group attended four one-hour sessions devoted to increasing physical activity self-efficacy, and developing self-regulatory techniques and outcome expectancy values. The control group only received a program assessment, instruction, and access to facilities. The researchers reported that those receiving the intervention significantly improved their self-regulation skills and outcome-expectancy values, while the control group reported decreases in the SCT constructs measured in this study. While the findings are limited, as physical activity was not assessed, it could be extrapolated that such an intervention can increase physical activity levels.

Support for SCT also emerged from a nutrition intervention for older adults with diabetes (Miller et al., 2002). This study evaluated a nutrition intervention based on information processing, learning theory, and SCT principles. Participants were randomly assigned to a control (n=50) and an experimental group (n=48). Those in the intervention group attended ten weekly group sessions led by a dietician. The researchers reported the experimental group had significantly greater improvements in positive outcome expectations, total knowledge, and self-efficacy.

In recent years, a variety of community-based diabetes prevention projects have been implemented in various Aboriginal communities across North America, notably in

Kahnawake (Macauley et al., 1997) and Hawaii (Mau et al., 2001). Although these projects were not specifically based on SCT, various constructs of SCT have been integrated and operationalized in these studies. Macauley and colleagues (1997) incorporated SCT constructs in their three-year community-based primary prevention program for non-insulin diabetes in Kahnawake schools. More specifically, Macauley and researchers (1997) included self-efficacy and modelling. These constructs were operationalized via various strategies within the project, including: (1) exposing children to healthy lifestyles of adults and elders; (2) supporting family activities in the communities; and (3) creating health education programs that emphasized increasing external gratification, increasing self-esteem, and creating positive attitudes. From the results of their study, it can be postulated that enhanced physical activity participation may be attributable to the operationalization of SCT constructs.

Mau et al. (2001) examined whether a family support system, for indigenous people of Hawaii, would improve diet and physical activity behaviour significantly more than a standard intervention. Both groups received a six-month culturally sensitive program, the intervention group differed in they had family support. Those receiving the support were more likely to advance in physical activity stage levels than the controls.

*The previous sub-sections highlighted the literature related to physical activity SCT constructs and interventions. The basis of these studies relies on the valid and reliable measurement of social-cognitive mediators and physical activity behaviour. The following section outlines the measurement issues related to social-cognitive theory*

*constructs and physical activity behaviour, along with related issues to general and Aboriginal populations.*

## 2.3 Measurement

### 2.3.1 Social Cognitive Theory Measurement

A critical element regarding the studies described above is the validity and reliability of the employed assessment tools. Various types of validity (e.g., content, construct, concurrent, predictive) and reliability (e.g., internal-consistency, test-retest) must be addressed to ensure the use of psychometrically robust SCT measures (Plotnikoff, 2002; Streiner & Norman, 1995). The literature has documented varying degrees of validity and reliability concerning SCT constructs (Marcus, Selby, Niauri & Rossi, 1992; Plotnikoff et al., 2001; Schuster et al., 1995; Stahl et al., 2001; Wallace et al., 2000). Among SCT constructs, the self-efficacy and social environment constructs have been subjected to the greatest amount of validity and reliability testing (Castro, Sallis, Hickmann, Lee & Chen, 1999; Schuster et al., 1995; Wallace et al., 2000). Although less frequently reported, other SCT constructs have reported similar quality levels of validity and reliability (Castro et al., 1999; Schuster et al., 1995). To date, however, studies have not examined the validity and reliability of SCT constructs in Aboriginal populations.

Traditionally, SCT measurement has emphasized assessment at the construct level (Plotnikoff, 2002; Streiner & Norman, 1995). The theoretical foundation of this approach is based on the assumption that items reflect unidimensional measures. This practice, however, has been recently challenged in the literature for not addressing the

issue of multidimensionality of scale items (Marsh, 1997; Rhodes, Plotnikoff & Spence, in press). For example, confidence to overcome soreness and confidence to overcome diabetes complications are items of an overall self-efficacy construct – – their relationship may be explained by common physical activity experiences. In this case, people who are experiencing soreness may also be experiencing diabetes complications, and a construct score in this case may accurately reflect their self-efficacy. Individuals, however, may be in a situation where they are experiencing diabetes complications and have no soreness (or vice versa). In this situation, the responses on the complications and soreness scales may differ, and a construct score may not accurately reflect overall self-efficacy. Furthermore, aggregation of these scales into a single construct may lose any differential predictive effect (Rhodes et al., in press).

Further, research has argued that single items can be good indicators of constructs, and past research has suggested that single items tend to have high levels of reliability (i.e., reproducibility) and correlate with external criteria (Ajzen, 2002; Rhodes et al., in press; Robins, Hendin & Trzesniewski, 2001). A study completed by Robins et al. (2001) examined the psychometric properties of a self-esteem measure based on a single-item. The researchers computed test-retest reliability using the Heise procedure, in which the scale had a test-retest reliability of 0.75 over a four-year time period. Furthermore, the single self-esteem item had high convergent validity with the multi-item Rosenburg self-esteem scale. In summary, it may also be beneficial to operationalize at the item level.

### 2.3.2 Physical Activity Measurement

The association of SCT constructs with physical activity behaviour cannot be evaluated meaningfully unless valid and reliable physical activity measures exist. Physical activity is scientifically defined as "any bodily movement produced via skeletal muscles that result in energy expenditure" (Caspersen, Powell & Christenson, 1985, pp. 126), and this is what researchers attempt to estimate in most studies. Physical activity is characterized by its mode, intensity, duration, and frequency. There are a variety of methods available to assess physical activity, including questionnaires, direct observations, heart rate monitors, diaries, motion sensors, and indirect calorimetry.

Questionnaires are a popular method to assess physical activity behaviour in population studies (Caspersen et al., 1985). Questionnaires are a relatively inexpensive way to estimate physical activity levels. This method permits estimating the physical activity behaviour of a large number of individuals while maintaining low investigator and response burden (Caspersen et al., 1985).

A variety of issues, however, must be considered when developing or selecting a questionnaire to ensure valid and reliable measures of physical activity. The researcher must decide what types of physical activities will be assessed, and what combination of light, moderate, and vigorous activities will be included. Some activity types include: leisure, occupational, household, transportation, and care-taking activities. Since household physical activity, walking, care-taking, and occupational activities encompass the greater portion of energy expenditure in minority subgroups, these four types of activities are frequently utilised in Aboriginal studies (Kriska, 2002).

Additionally, decisions regarding the use of broad open-ended questions (e.g., How many times in the last week did you participate in physical activity?) versus specific activities (e.g., How many times in the last week did you swim?) must be determined. Early studies (Eyler et al., 1998; Tortolero, Masse, Fulton, Torres & Kohl, 1999) report that interpretation of broad words such as physical activity may lead to variable results. In her recent article, Kriska (2000) also warns about an interpretation bias when broad questions are used, and suggests that it is best to use specific relevant activities for the ethnic/cultural group being studied.

Another consideration when selecting a questionnaire is whether to employ a self-administered or interview-administered questionnaire. While self-administered questionnaires may be more cost-effective, they may result in more errors. For example, a possible error is response editing (Kriska, 2000; Warnecke et al., 1999). Since being active is a socially desirable trait, it is possible that self reports of physical activity behaviours are overestimated (Matt, Garcia, Primicias, Frericks & De Faria, 1999). Furthermore, since English may not be the first language of many ethnic groups, individuals may have difficulty completing an English questionnaire. The employment of an interview-administered questionnaire in such cases may help alleviate some of these problems.

A final issue is the time-frame being assessed. Researchers have administered physical activity questionnaires with time-frames ranging from one week to a lifetime (Kriska et al., 2001; Wallace & Ballard, 2002). While assessing physical activities using an instrument with a wide time interval may reflect 'usual behaviour', these assessments are more vulnerable to recall bias and are less practical to validate.

Within the literature, a variety of questionnaires have been employed to assess physical activity behaviour of Aboriginal people. Authors have stressed the need for culturally relevant measures (Ainsworth et al. 1999). In Fisher and colleagues (1999) examination of physical activity patterns of Chippewa and Menominee Aboriginals, the Monitoring Optional Study of Physical Activity Question (MOSPA-Q) was used to measure physical activity in 1344 adults. Through interview-administered questionnaires, the MOSPA-Q assessed four dimensions of physical activity (i.e., leisure-time, occupational, household, and transportation) over a 12-month time period. Stolarczyk et al. (1999) examined behaviours in Native Americans with diabetes. Through interviews, the researchers of this study administered the Pima Physical Activity Questionnaire (PPAQ). The PPAQ collected information on the intensity, duration, and frequency of household, occupational, sport, and leisure activities over the past week. Kriska et al. (2001) employed the Modifiable Activity Questionnaire (originally the Pima Physical Activity Questionnaire) to assess physical activity behaviour in Native Canadians of Sandy Lake. This interview-administered questionnaire assessed occupational and leisure physical activity over the past year. Harnack et al. (1999) focused on a week of leisure-time physical activity in their study with Lakota Indians. Harnack and colleagues (1999) modified the Leisure-Time Exercise Questionnaire of Godin and Shephard (1985) to include questions relevant to the target population. In summary, various instruments have been used to assess physical activity behaviour in Native communities.

## 2.4 Age, Gender, and Disability: Correlates with Physical Activity

The principle of reciprocal determinism within the SCT recognizes that personal factors influence behaviour. Therefore, it is likely that age, gender, and disability are associated with physical activity behaviour. Growing evidence suggests that childhood is the most active time of life, after which physical activity participation begins to decline (Anderssen et al., 1996). Results from the 2001 Physical Activity Monitor (an annual survey of all Canadians) indicates the proportion of those physically inactive increases with age (Canadian Fitness and Lifestyle Research Institute [CFLRI], 2001). Among those with diabetes, Hays and Clark (1999) also found the amount of physical activity to decrease with age. Similar findings have been described among Aboriginals. Fisher et al. (1999) reported the likelihood of obtaining leisure-time activity decreased with advancing age among Chippewa and Menominee Indians.

Biological sex is correlated with physical activity in a number of studies (Fisher et al., 1999; Hays & Clark, 1999; Kaplan, Newsom, McFarland & Lu, 2001; Welty et al., 1995). More Canadian women (59%) than men (52%) are physically inactive (CFLRI, 2001). Further, Kaplan et al. (2001) compared physical activity behaviour among seniors aged 65 years or older, and reported that men were significantly more active than women. Similar findings have also been documented among those with diabetes. Hays and Clark (1999) reported that women with diabetes participated in less physical activity than their male counterparts. Among Aboriginals, there have been a limited number of studies that examined the relationship between sex and physical activity; however, it has been reported that females have lower levels of physical activity than their male counterparts (Fisher et al., 1999; Welty et al., 1995).

The most frequently reported form of disability by adults are mobility problems. Due to a limitation, 2.5 million Canadians (10.5%) have difficulty walking, climbing stairs, carrying an object for a short distance, or moving from one room to another (Statistics Canada, 2001). Since disability tends to limit the kinds and the amount of physical activity people can participate in, it is likely that disability is associated with physical activity behaviour. There is a limited amount of literature on the physical activity behaviour of people with physical and mental disabilities (Rimmer, Braddock & Pitetti, 1996). Kaplan et al. (2001) notes a decline in physical activity with an increase in chronic conditions. While inconclusive, there are suggestions that disability is correlated with physical activity.

*The underlying aim of the studies described in this chapter is the intent to increase healthy behaviours. A large component of this improvement in health behaviours is dependent on effectively disseminating the findings of such research. The following section examines the concept of dissemination related to the Aboriginal population.*

## 2.5 Dissemination

Systematic dissemination of research results can act as a health promotion activity and assist in the implementation of research findings to enhance health. Furthermore, dissemination, a practice central to health promotion, functions to increase visibility, community wide acceptability, and involvement (Bracht, Kingsbury & Rissel, 1999).

King, Hawe, and Wise (1998) describe five dissemination phases of a health promotion program: (1) communicating information regarding a new program; (2) convincing others of the relevance and applicability of the proposed program; (3) making a decision to implement the program; (4) changing practices to implement the program; and (5) sustaining these changes.

In the past, researchers in the fields of health and Aboriginal issues shared their results with funding agencies and colleagues by presenting papers and publishing in professional journals. This practice on its own is no longer acceptable, as community leaders, local health professionals, educators, and participants were often uninformed of the research findings. In more recent years, however, researchers are beginning to include dissemination in their research plan (Montour & Macaulay, 1988). For example, Montour and Macaulay's (1988) research on diabetes and atherosclerosis was designed and implemented with the purpose of returning the results to the Kahnawake community. Following the dissemination of their study's findings, there were increases in self-referral for dietary changes, weight loss, and exercise advice.

Because the audience of health promotion research is heterogeneous, dissemination may be at times challenging. A variety of strategies have been presented in the literature (Crosswaite & Curtice, 1994) that include: (1) ensuring sufficient resources (i.e., time and funds); (2) developing effective two-way communication for the duration of the project; (3) identifying key users before beginning the project; (4) specifying dissemination activities for targeted groups; and (5) identifying the individuals responsible for disseminating. Examples of dissemination techniques have included

radio talk shows, community presentations, and community newsletters (Macaulay et al., 1997).

## 2.6 Summary Literature Review

This chapter has addressed the literature regarding: (1) Aboriginal culture; (2) physical activity and diabetes; (3) physical activity among Aboriginal people; (4) SCT constructs and interventions; (5) measurement (i.e., social-cognitive and physical activity behaviour); (6) other correlates of physical activity; and (7) dissemination. Health behaviour research applicable to Aboriginals with diabetes is particularly important in light of recommendations advising lifestyle interventions to mange and prevent diabetes among Aboriginals (Daniel & Gamble, 1995).

Physical activity among Aboriginals is deeply rooted in cultural values and beliefs; therefore, it is imperative to consider cultural appropriateness when developing physical activity interventions. Although complete social-cognitive theories have not been applied to Aboriginals in the physical activity domain, the application of the SCT may have merit for this target population living with diabetes. Current research has provided significant evidence supporting the association and predictive ability of various SCT constructs in relation to physical activity behaviour with the general population (Booth et al., 2000; Ewart et al., 1986; Garcia & King, 1991; Sallis et al., 1986; Sallis et al., 1992; Schuster et al., 1995). Furthermore, a review of the literature clearly shows that some of the SCT constructs have descriptively been applied to the explanation of physical activity in Aboriginals (Eyler et al., 1999; Harnack et al., 1999; Stolarcyzk et al., 1999). In addition, from a health promotion perspective, the environment must be

considered in order to understand human behaviour. SCT considers the influence of environment, along with the cognitions and behaviours to be crucial elements in promoting physical activity behaviour. The cumulative evidence of the associations between SCT constructs and physical activity behaviour, and the theory's integration in health promotion concepts, suggests that SCT may be a well suited theory for this population. The following section details the research questions and hypotheses for the aims of this study.

## 2.7 Research Aims

Research Aim One

The first aim of this study is to examine the perceived meaning of physical activity among Aboriginals with type 2 diabetes.

*Research Question*: What is the perceived meaning of physical activity among Aboriginals with diabetes?

Research Aim Two

The second study aim is to assess physical activity behaviour levels amongst Aboriginals with type 2 diabetes.

*Research Question*: What are the physical activity behaviour levels of Aboriginals with diabetes?

Research Aim Three

The third research aim is to examine the association of key SCT constructs with physical activity behaviour amongst Aboriginals with type 2 diabetes.

*Hypotheses*: Key SCT constructs (i.e., self-efficacy, behavioural capability, observational learning, outcome expectations and environments) will be significantly associated with leisure physical activity behaviour (adjusting for age, sex and physical disability); however, key SCT constructs will not be significantly associated with non-leisure activities.

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# CHAPTER THREE- PAPER

## Physical Activity of Aboriginals with Type 2 Diabetes: An Exploratory Study

**ABSTRACT**

INTRODUCTION - It is widely recognized that type 2 diabetes has become a serious public health issue with prevalence rates markedly higher in Aboriginal than among non-Aboriginal populations. There are established mechanisms to reverse the diabetes epidemic – – physical activity is a key behavioural strategy for the prevention and management of type 2 diabetes. Given the magnitude of the diabetes epidemic among Canadian Aboriginals, and the corresponding need to develop physical activity interventions, the aims of this study were to: (1) examine the meaning of physical activity amongst Aboriginals with type 2 diabetes; (2) assess physical activity behaviour levels; and (3) examine the association of key Social Cognitive Theory constructs with physical activity behaviour.

METHODS - The sample consisted of 34 Alberta Aboriginals with type 2 diabetes who completed a survey comprised of questions regarding: (1) the perceived meaning of physical activity; (2) physical activity behaviour levels; and (3) SCT constructs (i.e., self-efficacy, behavioural capability, observational learning, outcome expectation, and environment).

RESULTS – An emerging theme revealed some participants perceived physical activity leisure-time activities as appropriate across the lifespan, while the majority perceived leisure-time activities were only for youth. Based on the reported energy expenditure estimates for leisure-time activities, 64.5% of participants were categorized as sedentary, 22.4% were considered moderately active, and only 16% very active. When occupational and household activities were taken into account, 25.1 % were categorized as moderately active, and 41.9% were considered very active. Bivariate correlations revealed that no

SCT constructs were significantly associated with leisure, non-leisure, and total energy expenditure scores.

CONCLUSION - Information encouraging leisure-type activities need to be promoted. Results suggest that educational programs are needed to ensure that people are aware of the benefits of physical activity and its role in the management of type 2 diabetes. Recommendations for conducting research on Aboriginal populations are also provided.

## INTRODUCTION

By the year 2010, it is anticipated that over 220 million people in the world will be living with diabetes (Zimmet, 2000). In Canada, diabetes is ranked as the seventh major leading cause of mortality. This condition contributes to approximately 5500 deaths a year; however, it is estimated that diabetes is a contributing factor in five times as many deaths (Health Canada, 1999). Over two million Canadians have been diagnosed with diabetes, and it is expected that this number will grow to over three million by 2010 (Canadian Diabetes Association [CDA], 2001). Type 2 diabetes has become a serious public health problem for the population at large (McGinnis, 2002); however, prevalence rates are two to six times greater in Aboriginal populations compared to non-Aboriginal populations (Daniel, Rowley, Herbert, O'Dea & Green, 2001; Delisle & Ekoe, 1993; Young, Szathmary, Evers & Wheatley, 1990).

Until 1940, diabetes was a rare condition in North American Aboriginals (West, 1974). Since then, type 2 diabetes has progressively risen to epidemic proportions (Horn, Paradis, Potvin, Macaulay & Desrosiers, 2001; Macaulay et al., 1997). It is presumed that environmental changes, genetic susceptibility to diabetes, and cultural transition from traditional to modern ways of living are factors that explain the high rates of diabetes among Aboriginal people (Knowler, Petitt, Saad & Bennett, 1990). The literature has reported high and variable prevalence rates of type 2 diabetes in Aboriginal communities across Canada which have tended to be lower in remote areas (Delisle & Ekoe, 1993; Zimmet, 1995). For example, in the remote northern territories, diabetes prevalence rates are among the lowest of Aboriginal groups in Canada (Health Canada, 1997). Harris and colleagues found type 2 diabetes prevalence rates of 36.4% in members aged 30-64 in

Sandy Lake, Ontario (Harris et al., 1997). Daniel, Gamble, Henderson, and Burgess (1995) reported a prevalence rate of 5.2% in natives of the Okanogan community (British Columbia). In Canada, type 2 diabetes is also a growing concern among Aboriginal children (Dean, Young, Flett & Wood-Steinman, 1998; Indian and Inuit Health Committee, 1995; Macaulay, Montour & Adelson, 1988). For example, in the Island Lake region of north-eastern Manitoba, Dean et al. (1998) reported a type 2 diabetes prevalence rate of 3.6% among children aged 10-19 years.

The promotion of physical activity may reverse the diabetes epidemic. Physical activity is a key behavioural strategy for the prevention and management of type 2 diabetes (Nieman, 1998). Research has shown that participation in regular physical activity decreases fasting blood glucose levels, and decreases insulin requirements (Kriska, Harris, Hanley & Zinman, 2001). In addition to physical activity's important role in diabetes management and glycemic control, it also confers several psychological (e.g., improved self-esteem, increased sense of well-being, enhanced quality of life) and other physiological (e.g., decreases in resting pulse rate, cardiac work, and low-density lipoprotein concentrations) benefits (Glasgow, Ruggiero, Eakin, Dryfoos & Chobanian, 1997; Lipson, Bonow, Schaefer, Brewer & Lingren, 1980).

Although there are recommendations advising physical activity participation to manage and prevent diabetes among Aboriginals, low leisure-time physical activity rates have been reported among Aboriginal populations (Ford & Herman, 1995; Hays & Clark, 1999). One study described that only 43% of Inuits and 38% of Dené participated in physical activity three or more times per week for at least 15 minutes (Imrie & Warren, 1988). Low levels of activity were also reported among British Columbia Aboriginals

(Penticton band, Spallumcheen band, and Okanogan band) with diabetes, with only 37% participating in 'sweat producing activities' at least three times a week (Daniel et al., 1995). In a more recent study in Sandy Lake, Kriska and colleagues (2001) reported that men participate in 6.9 hours of leisure-time activity per week while women only engage in 1.5 hours.

To ensure the development of culturally relevant assessment tools, related physical activity interventions, and program materials, the cultural meaning of physical activity needs to be examined (Allison, 1988). Studies exploring the perceptions of physical activity among Aboriginals are beginning to surface (Eyler et al., 1998; Henderson & Ainsworth, 2000, 2001). Henderson and Ainsworth (2001) explored how Native women perceived physical activity across their lifespan. Through interviews, the researchers noted participants commonly defined physical activity in terms of daily tasks such as household, childcare, and work related tasks. In another study, sociocultural perspectives of physical activity among older American Aboriginal women from the Pueblos and Navajo Nation of New Mexico were explored (Henderson & Ainsworth, 2000). Physical activity was reported to be part of their traditions (e.g., physical activity in dancing). To effectively change behaviour, the authors emphasize the importance of examining the sociocultural meaning of physical activity (Henderson & Ainsworth, 2000).

To intervene effectively on health promoting behaviours (e.g., physical activity), scholars and health professionals have focused considerable efforts on understanding the process of individual behaviour change and maintenance. A major theory of the social-cognitive theory literature is the Social Cognitive Theory (SCT; Bandura, 1977). SCT

attempts to understand, predict, and change volitional behaviour using several key constructs, including: self-efficacy, behavioural capability, observational learning, outcome expectancies, outcome expectations, environment, situation, self-control, emotional coping responses, and reinforcements. A key principle of SCT is reciprocal determinism where human behaviour is defined as a triadic, dynamic, and reciprocal interaction of personal, behavioural, and environmental factors that operate bi-directionally as interacting determinants (Bandura, 1977, 1986). Among the general population, the literature has reported significant evidence supporting the association of various SCT constructs in relation to physical activity behaviour (Booth, Owen, Bauman, Clavisi & Leslie, 2000; Ewart, Stewart, Gillian & Kelemen, 1986; Garcia & King, 1991; Sallis et al., 1986; Sallis, Hovell, Hofstetter & Barrington, 1992; Schuster, Petose & Petosa, 1995).

To date, the application of SCT has yet to be examined with Aboriginal people. However, there is some support for specific social-cognitive theory constructs from studies conducted with Aboriginals regarding physical activity. For example, Eyler et al. (1999) assessed the association of physical activity with social support among middle- and older-aged American Aboriginals/Alaskan Natives. As the researchers hypothesized, sedentary individuals were more likely to have low physical activity social support. On an Aboriginal reserve in South Dakota, Harnack, Story, and Rock (1999) noted that safety, childcare, and time were frequent barriers to physical activity participation. Stolarcyzk et al. (1999) explored knowledge and attitudes related to physical activity in Native Americans with diabetes, and found these individuals were unaware of the benefits of physical activity in relation to diabetes prevention and management; therefore,

supporting the need for educational programs to enhance the awareness of physical activity's role in type 2 diabetes management and prevention.

Endorsement of SCT-driven research in Aboriginal communities (e.g., Kahnawake and Hawaii) has also emerged in a variety of community-based projects (Macaulay et al., 1997; Mau et al., 2001). These studies integrated various elements of the SCT. For example, in Kahnawake self-efficacy and modelling were incorporated in a primary prevention project for non-insulin dependent diabetes (Macaulay et al., 1997). Their data suggest that increased physical activity participation may be attributed to the operationalization of these two SCT constructs.

In summary, although complete social-cognitive theories have not been applied to Aboriginals in the physical activity domain, SCT (Bandura, 1977) may have merit in this regard. A review of the literature clearly shows that certain SCT constructs may be associated with physical activity among Aboriginals (Eyler et al., 1999; Harnack et al., 1999; Stolarcyzk et al., 1999). Further, there is cumulative and consistent evidence supporting relationships between SCT constructs and physical activity behaviour in the general population. Moreover, from a health promotion perspective, the environment must be taken into account in understanding behaviour. SCT also considers the influence of the environment to be a crucial dimension in promoting physical activity behaviour.

This study is significant because of the diabetes epidemic among Canadian Aboriginals, and the corresponding need to develop physical activity interventions. Findings from existing SCT research in the general population cannot be generalized to Aboriginal populations because of the uniqueness of Aboriginal peoples' culture and values. It is, therefore, necessary that research be undertaken to: (1) examine the

meaning of physical activity (Research Aim One); (2) report the levels of this behaviour amongst Aboriginals with type 2 diabetes (Research Aim Two); and (3) examine the association of key SCT constructs with physical activity behaviour amongst Aboriginals with type 2 diabetes (Research Aim Three). It is hypothesized that key SCT constructs (i.e., self-efficacy, behavioural capability, observational learning, outcome expectations, and environments) will be significantly associated with leisure physical activity behaviour; however, key SCT constructs will not be significantly associated with non-leisure activities.

## METHODS

### Sample and Procedure

To qualify for the study, participants met five inclusion criteria: (1) Aboriginal ancestry; (2) 18 years of age or older; (3) adequate English skills; (4) not be infirm; and (5) not have gestational diabetes. Data collection consisted of two samples.

*Sample One:* This sample was comprised of individuals from an Aboriginal Reserve in Alberta. Located approximately 200 km northeast of Edmonton, in the "prairie" region of Canada, the Reserve is home to a Cree community of 4398 people with another 1727 individuals living off the reserve. The community is easily accessible year round by road and rail. Most residents speak both English and Cree, with many of the elders speaking only Cree.

Following Band Council approval, the researcher attended the community's diabetes program led by a resident Aboriginal community health representative trained in

basic health support. The researcher also travelled with the community health representative to the homes of community members with diabetes, where the community health representative performed foot care, answered questions, and discussed concerns. The researcher participated in these activities to develop a better understanding of Aboriginal culture, and to familiarize herself with the community.

Following a five-month familiarization period, the researcher began the study recruitment. The recruitment procedure consisted of two strategies: (1) identification of eligible individuals from the onsite health unit's diabetes registry; and (2) referrals from the community health representative. The community health representative played an essential role in identifying and recruiting eligible participants.

During the spring, summer, and fall of 2002, the questionnaire was interview-administered to recruited community members with type 2 diabetes living on the Reserve. The questionnaire took between 40 minutes to two-hours to complete. The sample consisted of 18 people (9 men, 9 women) between the ages of 40 and 83 years (M=58.4; SD=10.7) all previously diagnosed with type 2 diabetes. Twelve individuals were married or common-law, and the sample's mean body mass index (BMI) was 33.0 (SD=11.82).

*Sample Two:* As part of a larger longitudinal study, a random sample of adults aged 18 years and older residing in Alberta with type 1 or type 2 diabetes were recruited from: (1) the Canadian Diabetes Association Registry; and (2) a randomized digit dialling protocol (Plotnikoff, Birkett et al., 2001). The Population Research Laboratory at the University of Alberta posted a self-administered questionnaire to 4000 Albertans with

diabetes. Those who identified themselves as Aboriginals at time one were sent the same questionnaire as Sample One participants for the assessment at time two. Sixteen Aboriginal individuals (6 men, 10 women) between the ages of 40 and 80 years (M=55.6; SD=10.8) with type 2 diabetes completed the questionnaire. Ten individuals were married/common-law, and the sample's BMI was 31.89 (SD=6.8).

*Combined Sample:* The Combined Sample (n=34) was comprised of 15 men and 19 women between the ages of 40 and 83 years (M=57.1; SD= 10.7). Twenty-two individuals reported their marital status as married or common-law, and the sample's BMI was 32.5 (SD=9.7). Demographic information for Sample One, Sample Two and the Combined Sample are presented in Table 1. t-tests and chi-square analyses were performed between the two groups on age, BMI, sex, present marital status, present occupation, disability, and SCT constructs (defined below). These analyses revealed no statistical differences on any of the variables ($p < 0.05$ level) between the two groups. Data from both samples were combined to enhance qualitative comprehensibility, and to increase statistical power for quantitative analyses.

[Table 1 about here]

**Measures**

*Development Phase*

A literature review was conducted to develop a pool of potential items that could be used to measure SCT constructs (American Diabetes Association, 2002; Booth et al., 2000; Plotnikoff, Hotz, Birkett & Courneya, 2001; Stahl et al., 2001). From this pool, a draft questionnaire was developed. To ensure the questionnaire was culturally

appropriate and comprehensive, a team of experts comprised of a physician, an occupational therapist, and an Aboriginal community health educator, all of whom had employment and/or research experience with Aboriginals with diabetes, reviewed the questionnaire. The questionnaire items were revised by confirming, clarifying, adding and modifying the items in relation to culture. The instrument was then piloted to assess language, comprehensibility, and content appropriateness on a small sample (n=5) of the community members with diabetes. For pre-selected sections, open-ended questions were used to solicit content for scale items. As a second step, individuals were asked their opinion regarding the salience of pre-set items and the comprehensibility of these items. During these interviews, which were conducted in the workplace and at peoples' homes, the researcher was accompanied by the community health representative who assisted in translation when appropriate.

*Meaning of physical activity:* To assess the perceived meaning of physical activity, respondents were asked a series of open-ended questions which included: (1) What does physical activity mean to you? (2) What does physical activity mean to those in your community, including the elders and children? and (3) What do neighbouring Aboriginal communities think of physical activity?

*Energy Expenditure and Physical Activity Measure:* These measures were similar to the National Health Interview Survey (1991); however, a comprehensive list of leisure and occupational activities specific to Aboriginal culture were listed. Space was also provided for other activities that were not listed. Participants provided self-reported answers to the types of activities, the frequency of exercise bouts, approximate duration of each session over the previous two weeks, and average intensity of activity bouts.

From these reported activities, energy expenditure estimates were calculated. The metabolic equivalent (MET) scores used for leisure activities were based on Ainsworth and colleagues' (2000) compendium of physical activities comprised of 605 specific activities. The specific physical activities listed in the compendium exceeded the detail utilized for this study. To address this issue, a similar protocol as earlier studies (Jones et al., 1998; Sarkin, Nichols, Sallis & Calfas, 2000) was employed. For each activity listed in this study's survey, MET scores for corresponding activities from the compendium were assigned to three categories according to Pate and colleagues' (1995) classification (i.e., light = <3 METs, moderate = 3-6 METs, and vigorous > 6 METs). Based on these categories, an average MET score was computed for each activity, producing three MET values for each activity (one for each of the intensity categories). The MET score averages ranged between 2.4 and 8.2 for the various activities, and these averages where then used to compute energy expenditure. Separate energy expenditure variables were calculated to represent: (1) leisure-time energy expenditure; (2) non-leisure-time energy expenditure (i.e., occupational/household); and (3) total energy expenditure (i.e., leisure and non-leisure) energy expenditure. Participants were classified as being sedentary (0.0-1.4kcal/kg/day), moderately active (1.5-2.9kcal/kg/day), or very active (3.0 or more kcal/kg/day) based on their individual estimates (Schoenborn, 1986).

Public health recommendations focus on the accumulated time spent engaging in physical activity in a week (Pate et al., 1995). Canadian and American organizations claim the recommended levels of physical activity are associated with enhanced physical fitness, improved mental health, and reduced risk for several chronic diseases. In Canada, the recommended duration is 120 minutes or more a week of moderate intensity

activity accumulated by 30 minutes of activity on four or more days a week. In the United States, 150 minutes or more a week accrued by 30 minutes of activity on five or more days a week is specified (American's National Centre for Chronic Disease Prevention and Health Promotion, 1999). The accumulated minutes of leisure and total activities were also assessed to determine if the participants were meeting the recommended public health guidelines for both the Canadian and American guidelines.

*Self Efficacy:* Self-efficacy was assessed by using measures developed by Marcus, Selby, Niaura, and Rossi (1992), and modified by Plotnikoff, Hotz et al. (2001). Plotnikoff, Blanchard, Hotz, and Rhodes (2001) reported Cronbach's alphas of 0.88, 0.89, and 0.90 over three time-points for this scale. To establish further content validity of the scale, additional items were included from pre-pilot qualitative interviews with individuals living with diabetes.

The items employed five-point scale response options (not at all confident=1; very confident=5) to statements regarding each participant's confidence in his/her capabilities to organize and execute courses of actions required to participate in physical activity under a variety of circumstances. The self-efficacy scale consisted of 14 items, with six of these items specific to those with diabetes. Examples of items included, I am confident to participate in physical activity: "when I feel a little stiff or sore"; "when I have to find different activities due to my diabetes complications"; and "when I have to get up early." The items were summed and averaged to form the self-efficacy score (likewise for all other SCT constructs in this study). Cronbach's alpha for the 14-item self-efficacy scale was 0.78.

*Behavioural Capability:* The behavioural capability construct was measured using questions developed by the American Diabetes Association (2002) which were modified for this study. This construct was assessed by asking questions regarding participants' knowledge of the role of physical activity in the management of diabetes, and knowledge of the required steps to ensure safe physical activity participation. Since earlier studies (Bautista et al., 1999; Sallis et al., 1989) have assessed behavioural capability using dichotomous questions, the present study employed a similar format using 'agree' and 'disagree' as response options.

*Observational Learning:* The social modelling construct was assessed using measures developed by Booth et al. (2000), which were modified for this study. Participants were asked about the frequency with which they observed other people participate in physical activity. Responses to these items were recorded on a 5-point scale, ranging from 1 (never) to 5 (very often). Booth and colleagues' (2000) instrument was modified to recognize observational learning items relevant to Aboriginal people living with diabetes. Six additional social modelling items (i.e., children, community members, others with diabetes, spouse, neighbouring community, your community) relevant to those living with diabetes in the community were added. Cronbach's alpha for the seven-item observational learning scale was 0.77.

*Outcome expectation:* Two proxy outcome expectation scales consisted of: (1) five general and two diabetes specific positive items; and (2) six general and four diabetes specific negative items. These items were assessed by asking participants how much positive (e.g., regular physical activity helps me control my weight) and negative (e.g., getting regular physical activity would cost too much money) statements regarding

physical activity influenced their decision to do physical activity. A modified version of the Decisional Balance Questionnaire (Marcus, Rakowski & Rossi, 1992) adapted for the Canadian population (Plotnikoff, Blanchard et al., 2001) was employed. Plotnikoff, Blanchard et al. (2001) reported Cronbach's alphas of 0.79 for the positive subscale and 0.71 for the negative subscale. A two-week test-retest yielded coefficients of (r) 0.84 and 0.74 for the positive and negative subscales respectively (Plotnikoff, Blanchard et al., 2001). Based on pre-pilot interviews with people living with diabetes, seven items (5 positive and 2 negative) specific to those with diabetes were added. All items employed 'not at all' (1) to 'very much' (5) response options to the statements. Positive and negative statements were interspersed to avoid response-set behaviour. Cronbach's alpha for the positive scale (7 items) was 0.68, and for the negative scale (10 items) was 0.58.

*Social Environment:* Social environments were assessed by asking participants the frequency with which others motivated them to participate in physical activity (15 items) with a five-point Likert-type scale (never=1; very often=5). This construct was assessed using measures developed by Stahl et al. (2001) which were modified for this study. Two further items: 'others with diabetes' and 'neighbouring community' were included. Cronbach's alpha for the 15-item social environment scale was 0.73.

*Physical Environment:* The physical environment was assessed using measures developed by Sallis et al. (1992) which were modified for this study. These measures were comprised of two environmental subscales, including the home (i.e., owning physical activity equipment) and the community (i.e., access to facilities in the community). Items for both the home (9 items) and community (6 items) subscales

employed 'yes' or 'no' response options to owning home equipment and accessing facilities in the community.

**Analysis**

*Aim One:* A content analysis was completed in order to ascertain the attitudes and beliefs associated with physical activity. This process included both coding and categorizing patterns in the data (Mayan, 2001). The open-ended question was coded to identify consistent words, phrases, concepts or themes, and to simplify and organize the information. Once the coding was complete, the data were again extensively reviewed to categorize any underlying patterns.

*Aim Two*: Energy expenditure from the self-reported physical activity behaviour of the modified National Health Interview Survey (1991) was computed. Three energy expenditure scores were calculated: (1) leisure energy expenditure; (2) non-leisure energy expenditure; and (3) total energy expenditure. Minutes of activity performed at least at a moderate intensity were also calculated to assess public health guidelines.

*Aim Three*[1]*:* Bivariate correlations were conducted between age, gender, disability, and each SCT scale with: (1) (i) leisure energy expenditure, (ii) non-leisure energy expenditure, and (iii) total energy expenditure; (2) Canadian physical activity public health recommendations of 120 minutes or more a week of moderate intensity activity (i.e., leisure activity and total activity); and (3) the United States physical activity public health recommendations of 150 minutes or more a week of moderate intensity activity (i.e., leisure activity and total activity).

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[1] Prior to analyses, data were screened for accuracy of input, distribution and dealing of missing data, identification and dealing of outliers, and identification of heterodascity (Tabernache & Fidell, 1989).

## RESULTS

*Aim One:* The majority of participants associated physical activity with health benefits (see Table 2). Many were cognisant of at least one of the health benefits associated with physical activity. Physical activity was linked to maintaining health; spiritual, psychological, and physical benefits were mentioned. Participants commonly described the psychological benefits in terms of reducing stress and having a clear mind. Physical benefits were generally emphasized, including: staying fit, lowering blood sugar levels, maintaining weight, developing strength, extending life span, aging gracefully, maintaining mobility, minimizing further diabetes complications, and keeping joints mobile. Keeping healthy was the most frequently cited benefit; however, few were able to list the multiple benefits. Only four individuals described the importance of physical activity in minimizing future diabetes complications.

[Table 2 about here]

An emerging theme revealed the majority of participants perceived physical activity participation varied across the lifespan, with leisure activity being reserved for youth. These study participants commonly described youth as a period that involved recreational activities and an active lifestyle, and described adulthood as a time when activities focused on occupational and household duties. This view was repeatedly illustrated by the selection of household chores and childcare as the most frequent physical activities mentioned. Some individuals, however, did not share this continuum of change over the lifespan philosophy. These individuals believed that physical activity had a similar meaning across all ages, and people of all ages could participate in a wide

variety of leisure activities over their lifespan. Those surveyed perceived that other neighbouring Aboriginal communities had similar physical activity perceptions as their own.

*Aim Two:* In terms of physical activity levels, participants reported a mean leisure energy expenditure of 2.3 kcal/kg/day (SD=3.9), and a total energy expenditure of 6.5 kcal/kg/day (SD=9.2). Based on the leisure energy expenditure estimates, 64.5% were in the sedentary category, 22.4% were considered moderately active, and 16.0% active (see Table 3). When non-leisure activities were included, respondents categorized as sedentary decreased by more than half (to 29.0%) for total energy expenditure estimates.

In regards to the Canadian public health guidelines, 35.5 %[1] met the Canadian guidelines when total activities were recognized, with 25.8% achieving the guidelines when only leisure-time physical activity was considered (see Table 3). Similar percentages met the United States guidelines; with 35.5% meeting recommendations when total activities were recognized, and 22.6% achieving the guidelines when only leisure-time physical activity was considered.

[Table 3 about here]

Yard work, walking, and housework were the most frequently cited activities. 68.9% of participants reported walking for exercise at least once in the previous two weeks. Other than walking, however, few (32%) reported participating in other leisure type physical activities. Among the activities engaged in, 57.4% were classified as light

[1] Two cases who performed $\geq$ 20 minutes of vigorous leisure activity, three times a week were included in this category.

intensity activities, 31.9% were classified as moderate, and 10.6% were classified as vigorous intensity activities.

*Aim Three:* There were no significant correlations ($p > 0.05$) between any of the three energy expenditure scores with the SCT constructs; therefore, rejecting the hypotheses that leisure activity would be associated with SCT constructs but supporting the hypotheses that non-leisure activity would not be associated with SCT constructs (see Table 4). As a subsidiary and exploratory inquiry, correlational analyses were performed at the item level for each of the constructs as suggested by Rhodes, Plotnikoff, and Spence (in press). Given the multiple statistical tests, the Bonferroni correction procedure conservatively adjusted the alpha to the 0.01 level in order to minimize risk for making a type I error. Total energy expenditure was significantly correlated with the social environment item: '*motivated to do physical activity by the community school*' ($r = 0.57$). The self-efficacy items assessing confidence of participating in physical activity: '*when can't notice improvements*' ($r = -0.55$), and '*when having diabetes problems*' ($r = -0.55$) were correlated with participating in a total 120 minutes or more of moderate physical activity per week (Canadian public health criterion). These two items were also correlated ($r > 0.62$) with participating in a total of 150 minutes or more of moderate physical activity per week (United States public health criterion).

[Table 4 about here]

## DISCUSSION

The first aim of this study was to examine Aboriginal peoples' perceived meaning of physical activity. This is an important issue because cultural assumptions regarding physical activity may influence participation in this behaviour. Although this study did not extensively examine the perceptions of physical activity, results provide insight into some current beliefs related to physical activity. First, the benefits listed by the participants extended beyond the physical to also include the spiritual and psychological. This holistic approach was illustrated in murals around the health centre which describe health as: social, spiritual, physical, cultural, and mental (Field Note 2). Second, many Aboriginals with diabetes are aware of a limited number of physical activity benefits including its benefits for the management of diabetes. This suggests that more effort is required to ensure Aboriginals are cognisant of the multiple benefits that can occur when being regularly physically active. Educational programs are needed to enhance the understanding of physical activity, and its role in type 2 diabetes management and overall health. Third, most respondents believed recreational physical activity is only for the youth. This is consistent with earlier studies (e.g., Henderson & Ainsworth, 2001) that report recreational activities for this population are performed during childhood while adult activities are related to occupational and household duties. To help these adults gain the benefits of leisure-time physical activity, it is important to promote messages that encourage leisure-time activities. Messages should also contain information on how these activities can be modified to accommodate various abilities.

Energy expenditure estimates from recreational and conditioning activities in our study (Research Aim Two) indicate that 64.5% of the sample are sedentary. Other

studies have reported similar levels of inactivity. Findings from the 1991 National Health Interview Survey reveal that 65.7% of Americans with diabetes do not participate in regular physical activity. Fisher and colleagues' (1999) examination of leisure physical activity patterns among Chippewa and Menominee Aboriginals described that only 12% of women and 17% of men were active in the past year. The prevalence of physical inactivity in our study is slightly higher than national reported averages (i.e., the Canadian Fitness and Lifestyle Research Institute's 2001 Physical Activity Monitor reports that 55% of Canadians are inactive), and may be explained by the high prevalence of disability among people with diabetes. The leisure activity energy expenditure estimates clearly indicate this population is in need of targeted efforts to increase leisure-time activities.

Although the benefits of leisure-time activities have been well documented (Lipson et al., 1980; Nieman, 1998), research has also reported an association between participation in occupational activities and reduced risk of cardiac disease (Powell, Thompson, Caspersen & Kendrick, 1987). A strength of this study has been the inclusion of moderate intensity occupational and household activities. Failure to account for these activities may have inaccurately estimated physical activity levels. When total energy expenditure was considered, the proportion of the study's sample categorized as sedentary decreased by more than half (64.5% versus 29.0%). Since the researcher had observed the community primarily engaging in non-volitional activities, it was expected that when non-leisure activities were considered, the community would be less sedentary (Field Note 7). Other studies among Aboriginals have shown similar activity patterns as reported in our research. Ainsworth et al. (1999) reported that 30% of Native American

women were not meeting physical activity recommendations when total activity was considered. Although our findings reported only 29.0% of people were inactive (when considering total energy expenditure), future epidemiological research is required to assess the specific health gains (towards diabetes prevention and management) of occupational and household activities. If such studies confirm the beneficial effects of these forms of activities, then health promotion professionals should encourage policy and environmental changes supporting this issue. This would have positive implications on physical activity behaviour over the lifespan, since studies have shown that activities that are incorporated in ones lifestyle are more likely to be maintained (Pereira et al., 1998).

Similar to previous studies among Aboriginal and non-Aboriginal populations, walking was the most frequently cited leisure-type physical activity (Fisher et al., 1999; Siegal, Brackbill & Heath, 1995), and supports recommendations for the development of walking programs (Siegal et al., 1995). These activities are consistent with what the researcher frequently observed while in the community (Field Note 5). Such programs may be highly effective given the lower dropout rates in walking than in other exercise programs (Siegal et al., 1995).

Despite other Aboriginal studies (Harnack et al., 1999; Henderson & Ainsworth, 2000; Stolarcyzk et al., 1999) showing promise for SCT, the constructs tested in our study's third aim did not demonstrate significant relationships with leisure-time physical activity. These earlier studies, however, did not employ statistical tests (e.g., correlations, regression analyses) to establish the associations of these constructs with behaviour (Harnack et al., 1999; Henderson & Ainsworth, 2000; Stolarcyzk et al., 1999)

but instead used qualitative and/or descriptive methodologies. For example, Harnack and colleagues described the barriers that Lakota residents encounter when undertaking physical activity which may not necessarily be correlated with actual physical activity behaviour.

Although no research has examined non-leisure physical activity's relationship with SCT constructs among Aboriginals, it was hypothesized that there would be no relationship because SCT is employed to explain, understand, and predict volitional physical activity. Findings from the non-leisure physical activity correlational analyses are congruent with our hypotheses.

The exploratory findings from the item-level correlational analyses between leisure-time physical activity behaviour and SCT items suggest that specific SCT construct items may have utility towards understanding physical activity behaviour change among Aboriginals with diabetes. The results demonstrated significant correlations between a social environment item (i.e., school) and two self-efficacy items (i.e., when not noticing improvements, when having diabetes problems) with physical activity. These findings may guide appropriate strategies needed for community interventions by operationalizing these belief items.

Although our study provides limited support for SCT as a robust framework for explaining physical activity behaviour in Aboriginal people with diabetes, it should not be eliminated as a potential theory for explaining physical activity and operationalizing programs for the promotion of physical activity behaviour change in this population. This is due to two main reasons. First, because of the small sample, significance may not have been obtained due to the lack of statistical power. Although correlations were not

statistically significant with energy expenditure, the magnitude of a number of the positive associations with leisure-time physical activity reached levels of potential practical/clinical significance. Cohen (1988) classifies correlations from 0.1 to 0.3 as small and 0.3 to 0.5 as moderate. The results revealed that self-efficacy (r=0.25), observational learning (r=0.17), and social environment (r=0.23) were positively correlated with leisure-time physical activity and these constructs may have meaningful practice and research utility. Second, although modifications of construct items were conducted following pilot work, the core scale items were developed on non-Aboriginal populations, and may not be entirely salient for this population.

*Research Process*: Research in Aboriginal communities entails a unique set of challenges. It is important to reflect on the insights and lessons learned when working with such populations. The lessons generated from this study should prove helpful for future groups initiating research with Aboriginal communities. It is not the intent of the authors to claim the homogeneity of all Aboriginal communities, but to provide insight into what Aboriginal research entails.

A significant barrier to conducting Aboriginal research is the known historical and scientific exploitation of these people in health research endeavours (Dalton, 2002). Although researchers are not necessarily in a position to change the social structure, they can make significant contributions to the quality of research by partnering with communities. For quite some time, Aboriginal people have been concerned with how outsiders have inappropriately defined their needs, conceptualized their problems, and employed incongruent theoretical models aimed at improving the health of the community (Dalton, 2002). The current study was conceived as an examination of the

meaning and behaviour level of physical activity, and an exploration of the key SCT constructs with physical activity behaviour, rather than an intervention project based on community-directed solutions. Although the project's goals and general methods were outlined by the researcher, as much latitude as possible was given to the community. Concentrated efforts are needed to co-operate and create authentic partnerships with native communities.

Prior to beginning any form of research activity on an Aboriginal Reserve, it is critical to obtain support and approval from the Reserve's Chief and Council. This approval is ethically necessary and beneficial in developing and promoting such research projects in the community. Although support from the Chief and Council in our study facilitated the research, this support did not automatically lead to community approval. Additional efforts were, therefore, required to attain community-wide approval. Such efforts included researcher visibility, communication, and acceptance with the community.

When conceptualizing a project, it is important to factor in a familiarization period which may take weeks, months, or even years. The researcher became orientated with the community by attending weekly diabetes sessions and making home visits over a 5-month period. This familiarization period contributed to: (1) acquiring knowledge regarding the community's needs, traditions, culture, beliefs, and perceptions; (2) establishing mutual trust and understanding; (3) serving as a preliminary recruitment phase and promote the project; and (4) ensuring visibility of the researchers and the project. Researchers should only proceed with the study when the community has

attained a high level of comfort. Moreover, it is imperative that researchers are non-judgemental towards individuals and their cultures.

Although the degree of involvement of the community may vary, it is strongly recommended to involve the community in all research phases (i.e., planning, implementing, and dissemination), and for the community to be an equal member in the research process. It is important for researchers to have a strong commitment towards participatory research approaches consistent with health promotion ideologies (e.g., empowerment, citizen participation, and capacity building). The advantages of such involvement are: (1) to maximize participation; (2) to reduce and eliminate suspicions of research-associated abuse and exploitation; (3) to ensure that the process and the materials generated are culturally and linguistically appropriate; (4) to enhance the likelihood of the findings being integrated into the study; (5) to bring more meaningful conclusions; and (6) to ensure the validity of the findings. Within a participatory framework, defining the problem and the research objectives should begin with the specific needs and situation of the community. The use of community members in the multiple research phases led to the recruitment of more participants. In addition to building community capacity, community members' involvement permitted greater inclusion of the elderly who did not speak English. With the help of those in the community, it is recommended to outline possible recruitment strategies that may include: (1) setting up booths at community socials and cultural events; (2) local radio announcements; (3) distributing flyers within the community; and (4) word of mouth. For all these strategies, it is important to have community approval since the community may deem some strategies inappropriate. Although in the opinion of the researcher, the

current project had a substantial familiarization period, and community members were involved in the recruitment process, recruitment remained a significant challenge.

Another recommended strategy that may enhance the success of such projects is the provision of more immediate benefits to the community. Since the research objectives of this study began with confirming the application of the SCT in Aboriginals with diabetes, no immediate benefits were apparent. Although the examination of theories is important to the development of theory-based interventions, future investigations should focus on interventions where the immediate benefits are apparent.

The researcher's experience repeatedly verified the need for flexibility (e.g., project timelines, meetings, and deadlines). Conducting research with Aboriginal communities is a long endeavour and is an unlimited process. Unlike rigidly timed academic schedules and timelines, this type of research requires the researcher to have flexible timelines. It may be helpful to overestimate when scheduling appointments or completion dates.

Given the nature of the study, there were a number of limitations that need to be acknowledged. First, the questionnaire took between 40 and 120 minutes to complete, which may have limited the quality of responses by some participants. Although comprehensiveness is important to the content validity of the instrument's constructs, future investigations may try to minimize the time required for such assessments. An additional limitation regarding the questionnaire was the language. While efforts were made to simplify wording and translate into Cree, some participants had difficulty understanding the meaning of some questions. This may have been in part due to language and the ethno-meaning of the questions. Although the researcher was

accompanied by a community Aboriginal resident, a further limitation may be participants were not fully comfortable disclosing certain information because of the incongruent cultural identity of the researcher. Another limitation relates to the use of SCT measures validated for the general population. Although these measures were modified for Aboriginals with diabetes, the scales have not been extensively validated with this population. Future validation studies in this population could include work on the ethno-meaning of the SCT items. Despite the various recruitment strategies, a further limitation was the small sample size which limited the power to perform various statistical tests (e.g., multiple regression techniques). An additional limitation involved the measurement of physical activity levels. Self-reported physical activity assessments are estimates of physical activity behaviour, and assumes participants provide accurate information (Warnecke et al., 1997). Reliance is on question interpretation, memory retrieval, judgement formation, and truthfulness. To obtain more accurate estimates of energy expenditure, future studies should use a combination of a questionnaire and more objective assessments (e.g., pedometers, direct observation). It may also be merited for future research to explore an integrated chronic disease prevention approach since many of the most prevalent non-communicable diseases (e.g., cancer, cardiovascular disease, diabetes, and chronic pulmonary disease) are linked by their preventable risk factors (i.e., physical activity, diet, smoking). The World Health Organization (2000) recommends that action on these risk factors be undertaken in an integrated manner.

Diabetes is an epidemic among Canadian Aboriginals, and there is an urgent need to develop physical activity interventions because of its potential role in preventing and managing this condition. This preliminary exploration of the meaning of physical

activity and its behaviour, and exploratory examination of the SCT in this population will hopefully guide future research and practice in this area.

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**Table 1: Demographics of Aboriginal Reserve (Sample One), Alberta Province (Sample Two), and Combined Sample**

| Variable | Aboriginal Reserve Sample One (n=18) | | Alberta Province Sample Two (n=16) | | Combined Sample (n=34) | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | (SD) | Mean | (SD) | Mean | (SD) | p-value | |
| Age | 58.4 | (10.8) | 55.6 | (10.8) | 57.1 | (10.7) | 0.7 | NS |
| BMI | 33.0 | (11.8) | 31.9 | (6.8) | 32.5 | (9.7) | 0.8 | NS |
| | N | (%) | N | (%) | N | (%) | $X^2$ | |
| Sex | | | | | | | | |
| Male | 9 | (50.0) | 6 | (40.0) | 15 | (42.9) | 0.5 | NS |
| Female | 9 | (50.0) | 9 | (60.0) | 18 | (54.3) | | |
| Marital Status | | | | | | | | |
| Never Married | 1 | (5.6) | 1 | (6.7) | 2 | (6.1) | 6.0 | NS |
| Married/Common-law | 12 | (66.7) | 10 | (66.7) | 22 | (66.7) | | |
| Divorced | 1 | (5.6) | 1 | (6.7) | 2 | (6.1) | | |
| Widowed | 4 | (22.2) | 3 | (20.0) | 7 | (21.1) | | |
| Occupation | | | | | | | | |
| Home | 7 | (38.9) | 4 | (26.7) | 11 | (34.4) | 1.9 | NS |
| Office | 5 | (27.8) | 6 | (40.0) | 11 | (34.4) | | |
| Manual | 1 | (5.6) | 0 | (0) | 1 | (3.1) | | |
| Retired | 4 | (22.2) | 5 | (33.3) | 9 | (28.1) | | |

**Table 2: Reported Statements Regarding Physical Activity**

| Physical activity statements | Number of Participants |
|---|---|
| Staying fit | 1 |
| Decrease blood sugar | 4 |
| Feeling good | 1 |
| Keeping healthy | 6 |
| Controlling weight | 4 |
| Extending life | 1 |
| Stronger | 1 |
| Good physical health | 1 |
| Good mental health | 2 |
| Good spiritual health | 1 |
| Mobility | 2 |
| Aging gracefully | 2 |
| Decreasing stress | 1 |

**Table 3: Reported Energy Expenditure and Physical Activity Behaviour**

| Physical activity levels | Total Sample (n=31)[1] | |
|---|---|---|
| | Mean (Kilocalorie/day) | (SD) |
| Leisure Energy Expenditure [2,3] | 2.3 | 3.9 |
| Non-Leisure Energy Expenditure | 4.2 | 7.0 |
| Total Energy Expenditure [2] | 6.5 | 9.2 |
| | N | (%) |
| Total $\geq$ 150 minutes [4] | 11 | 35.5 |
| Leisure $\geq$ 150 minutes [4] | 7 | 22.6 |
| Total $\geq$ 120 minutes [4] | 11 | 35.5 |
| Leisure $\geq$ 120 minutes [4] | 8 | 25.8 |

*[1] Due to missing data and one outlier, three cases were not included in this analysis*
*[2] The two sub-samples were significantly different (Sample One had a higher mean)*
*[3] Calculated based on reported activities, duration, and intensity*
*[4] Calculated based on reported minutes of engaging in an activity at a moderate intensity or more over a week*

## Table 4: Pearson Correlations Among Variables and Descriptive Statistics

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | Mean (SD) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.71** | 0.92** | 0.38 | 0.33 | 0.38 | 0.33 | 0.25 | -0.30 | -0.05 | 0.03 | -0.25 | 0.10 | 0.15 | 0.26 | 0.17 | 0.08 | 0.18 | 6.49 (9.17) |
| 2 | | 0.71** | 0.45* | 0.47* | 0.45* | 0.47* | 0.25 | -0.33 | 0.17 | -0.10 | 0.01 | 0.23 | 0.08 | 0.18 | 0.18 | -0.11 | 0.08 | 2.30 (3.94) |
| 3 | | | 0.25 | 0.16 | 0.25 | 0.16 | 0.19 | -0.20 | -0.09 | 0.10 | -0.34 | -0.02 | 0.16 | 0.25 | -0.35 | 0.16 | 0.18 | 4.19 (6.97) |
| 4 | | | | 0.77** | 1.00** | 0.77** | 0.21 | -0.17 | -0.25 | 0.07 | 0.17 | -0.17 | 0.07 | 0.11 | -0.20 | -0.05 | 0.14 | N/A |
| 5 | | | | | 0.77** | 1.00** | 0.16 | -0.04 | -0.29 | -0.03 | 0.14 | -0.11 | 0.21 | 0.11 | -0.26 | -0.20 | 0.21 | N/A |
| 6 | | | | | | 0.77** | 0.21 | -0.17 | -0.25 | 0.07 | 0.17 | -0.17 | 0.07 | 0.11 | -0.20 | -0.05 | 0.14 | N/A |
| 7 | | | | | | | 0.16 | -0.04 | -0.29 | -0.03 | 0.14 | -0.11 | 0.21 | 0.11 | -0.26 | -0.20 | 0.21 | N/A |
| 8 | | | | | | | | -0.45* | 0.28 | 0.12 | 0.04 | 0.04 | 0.11 | 0.19 | -0.32 | 0.20 | -0.13 | 2.99 (0.70) |
| 9 | | | | | | | | | -0.12 | 0.18 | -0.03 | -0.13 | -0.30 | -0.20 | 0.37* | -0.26 | 0.18 | 4.28 (0.77) |
| 10 | | | | | | | | | | 0.39* | 0.29 | 0.50** | -0.37* | -0.64** | -0.04 | -0.14 | -0.47** | 2.61 (0.84) |
| 11 | | | | | | | | | | | 0.23 | 0.27 | -0.23 | -0.36* | -0.05 | 0.03 | 0.12 | 4.01 (0.56) |
| 12 | | | | | | | | | | | | 0.45* | -0.14 | -0.20 | 0.33 | -0.01 | -0.11 | 2.18 (0.56) |
| 13 | | | | | | | | | | | | | -0.16 | -0.20 | 0.03 | 0.08 | -0.05 | 2.46 (0.70) |
| 14 | | | | | | | | | | | | | | -0.65** | 0.03 | -0.22 | -0.15 | 2.94 (2.23) |
| 15 | | | | | | | | | | | | | | | 0.06 | -0.30 | 0.10 | 2.93 (1.96) |
| 16 | | | | | | | | | | | | | | | | 0.41* | 0.10 | 1.15 (1.15) |
| 17 | | | | | | | | | | | | | | | | | 0.08 | 57.06 (10.68) |

* $p < 0.05$ level ** $p < 0.01$ level

1. Total Energy expenditure
2. Leisure Energy expenditure
3. Non-leisure Energy expenditure
4. Total Canadian Public health guidelines
5. Leisure Canadian Public health guidelines
6. Total American Public health guidelines
7. Leisure American Public health guidelines
8. Self-efficacy
9. Behavioural Capability
10. Observational Learning
11. Outcome Expectation –Positive
12. Outcome Expectation – Negative
13. Social Environment
14. Physical Environment – Home
15. Physical Environment – Community
16. Disability
17. Age
18. Gender

# CHAPTER FOUR – CONCLUSIONS

*This chapter presents the main conclusions from the three study aims. The study limitations, future directions for research, and recommendations for policy and practice are then described.*

## 4.1 Main Conclusions

### 4.1.1 Research Aim One

The first aim of this study explored the meaning of physical activity. When asked what physical activity meant to individuals, the health benefits (e.g., spiritual, psychological, and physical) associated with physical activity were mentioned. Most individuals were able to identify one benefit, and only four people associated physical activity with managing diabetes. When prompted about other possible benefits, none were mentioned. Keeping healthy was the most frequently cited benefit.

Most participants viewed physical activity as something that was modified over the lifespan. Participants' cultural assumptions regarding physical activity appeared to be associated with their physical activity behaviour. Commonly, they described youth as a period that involved recreational activities and an active lifestyle. The participants described adulthood as a period where activities focused on occupational and household duties, and where leisure activities were reserved for youth. This representation was repeatedly illustrated by the selection of household chores and childcare as the most frequent physical activities mentioned. Some individuals, however, did not share this continuum of change over the lifespan philosophy; others believed that leisure activities could be enjoyed by all ages. To help Aboriginals with type 2 diabetes obtain the

benefits of leisure-time physical activity, it is important that messaging encouraging leisure-time activities be visible.

### 4.1.2 Research Aim Two

The second research aim assessed the physical activity behaviour levels among Aboriginals with diabetes. Based on reported leisure energy expenditure estimates, 64.5% were categorized as sedentary, 22.4% were moderately active, and only 16% were active. When occupational and household activities were added to the leisure energy expenditure estimates, those categorized as sedentary decreased by more than half (to 29.0%).

Walking was the most commonly reported leisure-time physical activity. 68.9% of participants reported walking for exercise at least once in the previous two weeks. Other than walking, very few (32%) reported participating in other leisure-time physical activities. Among the activities engaged in, 57.4% of the reported activities were classified as light intensity, 31.9% as moderate, and 10.6% as vigorous intensity. Although this study did not extensively examine the perceptions of physical activity, it does provide insight into some current beliefs and recommendations for activities of interest to this group.

### 4.1.3 Research Aim Three

The third research question examined associations between Social Cognitive Theory (SCT) constructs with physical activity behaviour. Self-efficacy, behavioural capability, observational learning, outcome expectations, social environment, and physical environment were not significantly associated with physical activity outcomes; therefore, not supporting hypothesized relationships with leisure-time energy

expenditure. As predicted, however, these constructs were not significantly associated with non-leisure energy expenditure.

Exploratory findings from correlational analyses between physical activity behaviour and SCT scale items suggest that the SCT may have merit. These results demonstrate significant correlations between two self-efficacy items and one social environmental item with the various measures of physical activity behaviour.

Although our study provides limited support for SCT as a robust framework for explaining physical activity behaviour in Aboriginal people with diabetes, it should not be eliminated as a potential theory for explaining physical activity in this population.

In order to conduct any research with an Aboriginal community, there must be an established relationship between the researcher(s) and the community. Therefore, when preparing the project's timeline it is important to factor in a familiarization period, which may take weeks, months, or even years. The purpose of this familiarization period is four-fold: (1) to develop an understanding of the community (i.e., needs, traditions, culture, beliefs, and perceptions); (2) to establish mutual trust and understanding; (3) serve as a preliminary recruitment phase and promote the project; and (4) ensure visibility of the researchers and the project.

Once a relationship has been established, researchers must obtain support and approval from the Reserve's Chief and Council; this is required before proceeding with any research activities. The purpose of this is two-fold: (1) it is ethically necessary; and (2) it helps confirm leader's endorsement of the project.

Throughout the research process, it is important that the researchers have a strong commitment to participatory research approaches consistent with health promotion

ideologies (i.e., empowerment, community participation, and capacity building). For research to be successful, it is critical that the community be involved in all phases of planning, implementing, and disseminating the research. Furthermore, it is important that the community be considered an equal member.

Defining the problem and the research objectives should begin with the specific needs and situation of the community. The current study was conceived as an examination of the meaning and behaviour level of physical activity, and an exploration of the key SCT constructs with physical activity behaviour, rather than an intervention project based on community-directed solutions. Although the project's goals and general methods were outlined by the researcher, as much latitude as possible was given to the community. Soliciting input during all aspects of the project may have made this research more successful in terms of recruitment and building a stronger base with the community. The advantages of such involvement may have: (1) maximized participation; (2) reduced and eliminated suspicions of research-associated abuse and exploitation; (3) ensured that the process and the materials generated were culturally and linguistically appropriate; (4) enhanced the successfulness of the project; (5) brought more meaningful conclusions; and (6) ensured validity.

This study focused on confirming the existing SCT; therefore, it had no immediate benefits. The examination of the SCT is important to the development of theory-based interventions; however, to ensure community interest future studies may want to focus on providing the community with more immediate benefits.

In terms of personal attributes, my experience repeatedly verified the need for flexibility (e.g., project timelines, meetings, and deadlines), and a non-judgemental

approach. With regards to flexibility, conducting research with Aboriginal communities is a long endeavour and is an unlimited process. Rigidly timed academic schedules and timelines often make it difficult to be flexible, and do not allow the time to develop the necessary level of support. It may be helpful to overestimate when scheduling appointments or completion dates. Finally, it is imperative that researchers not pass judgement on the culture and the people.

### 4.2 Study Limitations

Given the nature of the study, there were a number of limitations that need to be acknowledged. First, the questionnaire took between 40 and 120 minutes to complete. This duration may have limited the response of some participants. Although comprehensiveness is important for the validity and cost-effectiveness of the questionnaire, future investigations may try to minimize the time required for such instruments. An additional limitation regarding the questionnaire was the language. While efforts were made to simplify the language and translate where needed, some participants had difficulty understanding the meaning of some questions. More extensive work on the ethno-meaning of the questions is required for future studies. Another limitation may have been the participant's comfort in disclosing information to an outside researcher.

A further limitation was the use of measures developed for the general population. It was assumed that these scales were valid and reliable for this target population. These measures, however, have not been exhaustively validated among Aboriginals with diabetes; therefore, making it difficult to assess their true validity for this population.

Future studies should continue to validate SCT constructs related to physical activity behaviour for this target population.

A third limitation involves the measurement of physical activity levels. Self-reported physical activity measures are estimates of physical activity behaviour. Reliance must be on question interpretation, memory retrieval, judgement formation, and truthfulness in reporting and assumes that the participant provides accurate information. To obtain more precise and valid estimates of energy expenditure, more objective assessment procedures (e.g., direct observation, pedometers) should be used in combination the self-reported assessments.

Fourth, the current study only included 34 participants. With a limited sample size, individual outliers could significantly affect the results. Furthermore, significance of the SCT constructs in Aim Two may not have been attained due to the lack of statistical power (i.e., due to small sample size). Lack of power also limited performing certain statistical analysis (e.g., simultaneous regression analysis). Moreover, this was not a representative sample; therefore, limiting the generalizability of the study findings.

Fifth, this was a cross-sectional study; therefore, causation cannot be implied by the correlational data. Future investigations should include longitudinal designs to examine the predictive ability of SCT constructs for physical activity behaviour change in this population.

### 4.3 Future directions for research

Future research is required to further refine and standardize appropriate measures. Based on pilot work, the present study used versions of previously developed scales on

the general population that were modified for this study. Further research is necessary to examine the validity and reliability of the SCT constructs among Aboriginals with diabetes. As specified above, future physical activity studies also need to evaluate SCT constructs in large community-based samples, and examine these constructs longitudinally.

Physical activity promotion offers a solution to the diabetes epidemic; however, it is only part of the solution. Health professionals will only be able to counteract the development and management of diabetes if physical activity interventions are in conjunction with nutritional changes, environmental changes, and pharmaceutical drugs. Further research is, therefore, necessary to examine and develop a comprehensive approach to diabetes management.

Another critical direction for future research is the development of community-based and culturally-sensitive diabetes interventions. It is important that the developed materials be linguistically and culturally consistent with indigenous practices. It is important that these interventions employ a participatory action research approach. In addition, such approaches should resonate with health promotion ideologies (i.e., empowerment, community participation, and capacity building).

### 4.4 Recommendations for Practice and Policy

Given the small number of individuals who reported engaging in sufficient leisure-time physical activity to experience its health benefits, there is a need to develop physical activity interventions for Aboriginals with diabetes. These programs should be community-based and culturally-relevant. In order to maximize community

participation, the initiatives need to involve elders, chiefs, and other community leaders. These programs should be supported in a healthy public policy which supports active living and health enhancing environments.

Walking was the most frequently reported physical activity. Therefore, environmental and political changes are required that would maximize peoples engagement in walking. For example, creating safe walking trails would provide opportunities to facilitate walking which may subsequently enhance participation.

Participants frequently reported participating in occupational and household activities. If future epidemiological studies demonstrate health benefits (in terms of diabetes management) for these types of activities, strategies may want to focus on promoting occupational and household activities.

The results from this study suggest that SCT constructs in part may have merit in the development of physical activity interventions among Aboriginals. The findings from the item-level analyses imply that one social environmental item (i.e., community school) and two self-efficacy items (i.e., not noticing improvements from physical activity, when experiencing diabetes problems) may have utility towards intervention development. This suggests that the school should play a central role in encouraging physical activity. Therefore, staff, teachers, and principals may want to encourage the community through community events. Item level findings of self-efficacy indicate that health professionals and those close to people with diabetes should be encouraging Aboriginals with diabetes when they cannot notice improvements from physical activity, and when they are experiencing diabetes problems.

Diabetes is a growing concern among Canadian Aboriginals, and there is an urgent need to develop physical activity interventions to manage and prevent this condition. The findings from this research confirm the need to develop physical activity interventions for this population, and suggest that SCT in part may help guide the development of such initiatives.

# APPENDIX I – DETAILED METHODS

Overview of the Chapter

*The purpose of this Appendix is to provide a comprehensive account of this study's methods: (1) the participants sampled; (2) the procedures; (3) the instrumentation employed; and (4) the analyses. The study consisted of two samples. The first sample included participants with diabetes from an Aboriginal Reserve. The second sample was comprised of a sub-sample of self-identified Aboriginals from a larger sample of Albertans with diabetes. The study employed four phases. The first phase was the preliminary work to gain access to the community, and to develop a better understanding of Aboriginal issues (Sample One). The second phase involved the development and refinement of the study's questionnaire. Phase three involved the administration of the instrument to both study samples. The final phase consisted of dissemination strategies to both of the samples.*

## I.1 Participants

To qualify for the study, participants met five inclusion criteria: (1) Aboriginal ancestry; (2) 18 years of age or older; (3) adequate English skills; (4) not be infirm; and (5) not have gestational diabetes. Two sampling frames were used for this study.

### I.1.1 Sample One

This sample was comprised of Aboriginals residing on the Saddle Lake Reserve in Alberta, Canada. This Reserve covers 63704 acres, and is home to a Cree community of 4398 people with another 1727 individuals living off the Reserve. The Reserve is

located approximately 200 km northeast of Edmonton, in the "prairie" region of Canada. The community is easily accessible year round by road and rail. Most people speak both English and Cree, with many of the elders speaking only Cree.

Today, the Reserve houses several facilities including a school, band offices, daycare centre, group home, senior citizens centre, arena, various recreation buildings, and a fire hall. The community also provides an array of services such as garbage collection, water systems, and sewer systems. The development of the Reserve led to the emerging of several economic activities including a convenience store, billiards, arcade, taxi services, and construction companies.

The recruitment procedure consisted of two strategies: (1) identification of eligible individuals from the health unit's diabetes registry; and (2) referrals from the community health representative. The community health representative (a resident of the Reserve) played an important role in identifying and recruiting eligible participants. The sample consisted of 16 people (8 men, 8 women) previously diagnosed with type 2 diabetes between the ages of 40 and 83 years (M=57.8; SD=10.9). Twelve individuals were presently married or common-law, and the sample's mean body mass index (BMI) was 30.3 (SD=4.4).

### I.1.2 Sample Two

As part of a longitudinal study, a random sample of adults aged 18 years and older residing in Alberta with type 1 or type 2 diabetes were recruited from: (1) the Canadian Diabetes Association Registry; and (2) a randomized digit dialling protocol (Plotnikoff, Birkett et al., 2001). Those who identified themselves as Aboriginals (n=16) at time one,

were sent the questionnaire of this study at time two. The self-identified Aboriginal sample of 16 individuals (6 men, 10 women) with type 2 diabetes between the ages of 40 and 80 years (M=54.6; SD=10.9) completed the questionnaire. Ten individuals were married or common-law, and the sample's BMI was 32.0 (SD=6.6).

### I.1.3 Combined Sample

The Combined Sample (n=34) was comprised of 15 men and 19 women between the ages of 40 and 83 years (M=56.7; SD=10.7). Twenty-two individuals responded they were married or common-law, and the sample's mean BMI was 32.5 (SD=9.6).

## I.2 Procedures

*The research methods consisted of four phases, and employed a combination of qualitative and quantitative approaches. The methodological steps for conducting research in this setting were established by examining Aboriginal literature, and discussions with other researchers in the area. Phase One describes the preliminary work undertaken to gain access to the community and develop a better understanding of Aboriginal communities. Phase Two presents the development and refinement of the questionnaire among Saddle Lake community members with diabetes. Phase Three describes the administration of the questionnaire. Last, Phase Four outlines the dissemination techniques and strategies used. Phase One and Two involved the Saddle Lake community, and Phases Three and Four employed unique procedures for the two sampling frames.*

### I.2.1 Phase One –Developmental Work

The duration of the first phase was five months. In January 2002, the researcher attended a Band Council meeting to seek approval for the project. During this time, Council was presented with a general overview of the project and its objectives. At this time, permission was sought to: (1) observe the community; (2) collect data; and (3) publish results in a scientific journal. A question period then followed to respond to any inquiries and concerns, and to note any suggestions or comments regarding the study. The Chief and Band Council expressed their desire to have their community participate in the study, and granted approval for the project.

After permission was received, the researcher attended the community's diabetes program weekly for five months. The health program was led by a local community health representative. Community members with diabetes were invited to partake in an exercise class, a health discussion, and a light lunch every Tuesday morning. This was all provided at no cost to community members. The morning began with an exercise class, which was comprised of low-impact activities focusing on strength, cardiovascular, flexibility, and coordination. The community health representative initiated the first few exercises, and then each participant took turns suggesting an activity for the group to complete. Following the exercises, a health topic relevant to those with diabetes was presented using various modes of delivery (e.g., bingo, video). Despite the potential benefits of this program, attendance rates were low. Lack of transportation, childcare, employment, and household chores were the most popular reasons why members were unable to attend.

In the afternoons, the researcher travelled with the community health representative to the homes of community members with diabetes, where the community health representative performed foot care activities, answered questions, or discussed concerns. This phase guided the researcher regarding appropriate procedures and questionnaire elements.

### I.2.2 Phase Two - Scale Development

A literature review was conducted to develop a pool of potential items that could be used to measure SCT constructs (American Diabetes Association, 2002; Booth, Owen, Bauman, Clavisi & Leslie, 2000; Plotnikoff, Blanchard, Hotz & Rhodes, 2001; Plotnikoff, Hotz, Birkett & Courneya, 2001; Sallis, Hovell, Hofstetter & Barrington, 1992; Stahl et al., 2002). From this pool, a draft of a questionnaire was developed. In order to ensure the questionnaire was culturally appropriate and comprehensive, a team of experts consisting of a physician, an occupational therapist, and a resident (i.e., Aboriginal community health representative), all of whom had employment and/or research experience with Aboriginals with diabetes, reviewed the questionnaire. The instrument's questions were subsequently revised by confirming, clarifying, adding, and modifying the items in relation to culture. Several of the comments provided were in regards to simplifying the language used.

Following the review of the questionnaire, the expert team suggested the most appropriate data collection procedure for this population would be personal interviews. This would minimize language and cultural barriers, and limit possible embarrassment

surrounding illiteracy. Furthermore, interviews would more likely lead to useful and meaningful results.

Pre-selected sections of the instrument were then pilot tested to assess language, comprehensibility, and content appropriateness on a small sample (n=5) of the Reserve who had type 2 diabetes. Open-ended questions were used to solicit content for scale items. As a second step, individuals were asked their opinion regarding the salience of pre-set items and the comprehensibility of these items. Those interviewed tended to agree and did not have a distinctive opinion to assist with the translation. The community health representative accompanied the researcher at the households and worksites. A script was recited for each participant describing the project's objectives and methods, and outlining ethical guidelines being employed. The interview duration ranged in length from 30 minutes to one-hour. From these responses, additional items were added to the instrument (see Section I.3 for detailed additions).

### I.2.3 Phase Three - Questionnaire Administration

*Sample One*

During the spring, summer, and fall of 2002 the questionnaire was administered to recruited community members of the Saddle Lake Reserve living with type 2 diabetes. A similar protocol to the administration of the pilot questionnaire was implemented; however, participants in this phase completed all sections of the questionnaire. The sequences of the questions were identical for all participants. The administration of the questionnaire ranged in length from 45 minutes to two-hours. Two participants lost concentration in the later sections of the questionnaire, and were given a short break prior to completing the instrument.

*Sample Two*

The Population Research Laboratory at the University of Alberta posted a self-administered questionnaire to a recruited sample of 16 Albertans with diabetes along with an information sheet describing the project and consent form. The participants were instructed to mail the completed questionnaire and the signed consent form in an enclosed return postage paid envelope to the University. After two weeks, a reminder postcard was sent, prompting individuals to return the questionnaire at their earliest convenience.

### I.2.4 Phase Four – Dissemination of Results

Systematic dissemination of research results can act as a health promotion activity, and assist in the implementation of research findings to enhance health. A large component of improving health behaviours lies in effectively disseminating the findings of such studies. The researcher employed two different dissemination strategies for the respective samples.

*Sample One*

It was the intent from the outset of the project to disseminate the results of the study to the Reserve community. The researcher discussed potential dissemination methods with the community health representative. Following these discussions, the community health representative recommended a written report of the study findings to be sent to Band Council members and local health workers. The report was comprised of: (1) a summary of the study results; (2) an inventory of recommended physical activities for various age groups and abilities; and (3) a list of referrals where the

community health representative could receive some brief training on physical activity for this population.

*Sample Two*

Based on their questionnaire responses, participants were sent (May 2003) personalized results, and suggestion on how to increase or maintain their physical activity behaviour. These participants also received the age-specific (i.e., general or older adult) Canada's Physical Activity Guide to Healthy Active Living.

## I.3 Instrumentation (see Appendix II)

### I.3.1 Demographic Characteristics

The demographic information collected included: sex, age, height, weight, marital status, number of adults and children in household, occupation, and disability. To calculate body mass index (BMI), self-reported weight and height were collected. Health Canada (2003) classifies BMI (weight/height$^2$) using the following categorizes: ≤18.4 (i.e., may be associated with health problems for some people), 18.5-24.9 (i.e., healthy weight for most people), 25.0-29.9 (i.e., may lead to health problems for some people), and ≥30.0 (i.e., increased risk of developing health problems). These Health Canada cut-points were used for this study.

### I.3.2 Meaning of Physical Activity

To assess the perceived meaning of physical activity, respondents were asked a series of open-ended questions which included: (1) What does physical activity mean to you? (2) What does physical activity mean to those in your community, including the

elders and children? and (3) What do neighbouring Aboriginal communities think of physical activity?

### I.3.3 Physical Activity Measure

The collected measures were similar to the National Health Interview Survey (1991); however, a comprehensive list of leisure and occupational activities specific to Aboriginals were listed. Space was also provided for other non-listed activities. Participants provided self-reported answers to the types of activities, the frequency of exercise bouts, the approximate duration of each session, and the average intensity of activity bouts over the past two weeks. The frequency questions asked participants to report how many times in the past two weeks they participated in the listed activity. The duration questions asked participants to report the average duration spent performing each activity. With four categories, the intensity questions asked participants to describe their usual heart rate changes when performing the activity: (1) no change in heart rate; (2) small change in heart rate; (3) medium change in heart rate; and (4) large change in heart rate. For analysis purposes, the categories 'no change in heart rate' and 'small change in heart rate' were collapsed to yield a total of three categories.

Energy expenditure was calculated based on an estimated energy expenditure equation (Weller & Corey, 1998):

$$EE = \frac{(N \cdot D \cdot MET) + (N \cdot D \cdot MET) + (N \cdot D \cdot MET) + \ldots}{14 \text{ days}}$$

Where: EE = energy expenditure in kcal $\cdot$ kg$^{-1}$ $\cdot$ week$^{-1}$
N = number of days of activity in the past two weeks
D = duration in minutes of specified activity level
MET = mean metabolic equivalent value specific for the activity and level of intensity (kcal $\cdot$ kg$^{-1}$ $\cdot$ minute$^{-1}$)

The metabolic equivalents (MET) scores used for activities were based on Ainsworth and colleagues' (2000) compendium which is comprised of 605 specific physical activities. The physical activities listed in the compendium exceeded the detail utilized for this study. To address this issue, a similar protocol as previously used in other studies (Jones et al., 1998; Sarkin, Nichols, Sallis & Calfas, 2000) was employed. For each activity listed in the study's survey, MET scores of the corresponding activities from the compendium were assigned to three categories according to Pate and colleague's (1995) classification (i.e., light = <3 METs, moderate = 3-6 METs, vigorous >6METs). Based on these intensity categories, an average MET score was computed for each activity, producing three MET values for each activity (i.e., one for each of the intensity categories). The MET score averages ranged between 2.4 and 8.2 for the various activities, these averages were then used to compute energy expenditure estimates. Separate energy expenditure variables were calculated to represent: (1) leisure-time energy expenditure; (2) non-leisure-time energy expenditure (i.e., occupational/household); and (3) total energy expenditure (i.e., leisure and non-leisure). Based on their individual estimates, participants were classified as being sedentary (0.0-1.4 kcal/kg/day), moderately active (1.5-2.9 kcal/kg/day), or very active (3.0 or more kcal/kg/day; Schoenborn, 1986).

Public health recommendations focus on the accumulated time spent engaged in weekly physical activity (Pate et al., 1995). Canadian and American organizations claim that the recommended levels of physical activity are associated with enhanced physical fitness, improved mental health, and reduced risk for several chronic diseases. In Canada, the recommended duration is 120 minutes or more a week of moderate intensity

activity accumulated by 30 minutes of activity on four or more days per week; while in the United States, 150 minutes or more a week accrued by 30 minutes of activity on five or more days per week is specified. The accumulated minutes of both leisure and total physical activity were assessed to determine if participants were meeting the recommended public health guidelines for both the Canadian and American guidelines.

*The following section outlines the SCT constructs used in this study. To reduce response burden only six SCT constructs were chosen. Two principles guided the selection of the SCT constructs in this study. Constructs were included if they had been identified in the literature as associated with physical activity, and second, if they were culturally relevant to the study sample.*

### I.3.4 Self-efficacy Measure

Self-efficacy was assessed by a measure initially developed by Marcus, Selby, Nauri, and Rossi (1992), and modified by Plotnikoff, Hotz et al. (2001). Plotnikoff, Blanchard et al. (2001) reported Cronbach's alphas of 0.88, 0.89, and 0.90 over three time points for this scale. To establish further content validity of the scale, additional items were included from qualitative pre-piloting interviews with individuals living with diabetes.

The items employed five-point scale response options (not at all confident=1; very confident=5) to statements regarding each participant's confidence in his/her capabilities to organize and execute courses of actions required to participate in physical activity under a variety of circumstances. The self-efficacy scale consisted of 14 items (Table I.1) with six items specific to those with diabetes. The items were summed and

averaged to form a final self-efficacy score (likewise for all other SCT constructs in this study). Cronbach's alpha for the 14-item self-efficacy scale was 0.78.

**Table I.1 - Physical Activity Self-Efficacy Items***

| |
|---|
| -When I am a little tired. |
| -When I am in a bad mood or feeling depressed. |
| -When I have to do it by myself. |
| -When it becomes boring. |
| -When I can't notice any improvements in my fitness. |
| -When I have many other demands on my time. |
| -When I feel a little stiff or sore. |
| -When the weather is bad. |
| -When I have to get up early. |
| -When I have diabetes problems. |
| -When I have to find different activities due to my diabetes complications. |
| -When I have to let others know I have diabetes. |
| -When I feel a little ill. |

*Items correspond to questionnaire items E1 to E14 in Appendix II

### I.3.5 Behavioural Capability

The behavioural capability construct was measured using questions developed by the American Diabetes Association (2002), and modified for this study. This construct was assessed by asking questions regarding participant's knowledge of the role of physical activity in the management of diabetes, and knowledge of the required steps to ensure safe physical activity participation (Table I.2). Since several earlier studies have assessed behavioural capability using dichotomous questions, the present study employed a similar format using 'agree' and 'disagree' as response options (Bautista et al., 1999; Sallis et al., 1989).

**Table I.2 - Physical Activity Behavioural Capability Items***

| |
|---|
| -Regular physical activity is an important part of your diabetes treatment plan. |
| -Regular physical will lower your blood glucose control. |
| -You're on a low-calorie diet. You can skip physical activity. |
| -Regular physical activity does not provide health benefits for people with diabetes. |
| -Because of my diabetes, I must take special precautions when participating in physical activity. |

*Items correspond to questionnaire items D1 to D5 in Appendix II

### I.3.6 Observational Learning Measure

The social modelling construct was assessed using measures developed by Booth et al. (2000) that were modified for this study. Participants were asked the frequency they saw other people participate in physical activity (Table I.3). Responses to these items were recorded on a five-point scale ranging from 1(never) to 5 (very often). Booth and colleagues' (2000) instrument was modified to recognize observational learning items relevant to Aboriginal people with diabetes. Six additional social modelling items (i.e., children, community members, others with diabetes, spouse, neighbouring community, your community) relevant to this context were added. Cronbach's alpha for the seven-item observational learning scale was 0.77.

**Table I.3 - Physical Activity Observation Learning Items***

| |
|---|
| -Friends and acquaintance. |
| -Family and relatives. |
| -Children. |
| -People in your neighbourhood. |
| -Community members. |
| -Others with diabetes. |
| -Spouse. |
| -Neighbouring community. |
| -Your community. |

*Items correspond to questionnaire items J1 to J9 in Appendix II

### I.3.7 Outcome Expectation

Two proxy outcome expectation scales consisted of (1) five general and two diabetes specific positive items, and (2) six general and four diabetes specific negative items (Table I.4). These items were assessed by asking participants the extent positive statements (e.g., regular physical activity helps me control my weight) and negative statements (e.g., getting regular physical activity would cost too much money) regarding physical activity influenced their decision to do physical activity. A version of the Decisional Balance Questionnaire (Marcus, Rakowski & Rossi, 1992) adapted for the Canadian population (Plotnikoff, Blanchard et al., 2001) was employed. Plotnikoff, Blanchard, and colleagues reported Cronbach's alphas of 0.79 for the positive subscale, and 0.71 for the negative subscale. A two-week test-retest yielded coefficients of (r) 0.84 and 0.74 for the positive and negative subscales respectively. All items employed 'not at all' (1) to 'very much' (5) response options. Seven items (5 positive, 2 negative) relevant to those with diabetes were added based on pre-pilot interviews with people with diabetes. Positive and negative statements were interspersed to avoid response-set behaviour. Cronbach's alphas for the positive scale (7 items) was 0.68, and for the negative scale (10 items) was 0.58.

**Table I.4 - Physical Activity Outcome Expectancy Items***

| **Positive** |
|---|
| -Physical activity would help me deal with stress. |
| -I would feel more confident about my health by getting regular physical activity. |
| -I would sleep better. |
| -Physical activity would help me have a more positive outlook. |
| -Physical activity would help me control my weight. |
| -Regular physical activity would decrease my chances of having further diabetes complications. |

-Regular physical activity would help control my sugar level.

**Negative**

-Physical activity would take too much of my time.

-I would have less time for my family and friends if I participated in physical activity.

-I'd be too tired to get physical activity because of my other daily responsibilities.

-I'd worry about looking awkward if others saw me being physically active.

-Getting physical activity would cost too much money.

-Regular physical activity would require that I monitor my glucose levels more closely.

-Regular physical activity may lead to an insulin reaction.

-Regular physical activity will require me to let others know I have diabetes and teach them how I can help them.

-Regular physical activity will require me to rely on others if complications occur.

-Regular physical activity would cause me physical injury.

*Items correspond to questionnaire items F1 to F17 in Appendix II

### I.3.8 Social Environment

Using a five-point Likert scale (never=1, often=5), social environments were assessed by asking participants the frequency that others motivated them to participate in physical activity (15 items; see Table I.5). This construct was assessed using measures developed by Stahl et al. (2001) that were modified for this study. Stahl and colleagues reported a Cronbach's alpha reliability coefficient of 0.57 for the original 13-item scale. Two further items, 'other with diabetes' and 'neighbouring community' were included. Cronbach's alpha for the 15-item social environment scale was 0.73.

**Table I.5 - Physical Activity Social Environment Items***

-Friends and acquaintance

-Spouse or common-law

-Family and relatives

-Children

-Workplace

| |
|---|
| -Others with diabetes |
| -School |
| -Community |
| -Journal or newspaper |
| -Television or radio |
| -Health unit |
| -Doctor |
| -Chief and Council |
| -Neighbouring community |

*Items correspond to questionnaire Items I1 to I14 in Appendix II

### I.3.9 Physical Environment

The physical environment was assessed using measures developed by Sallis et al. (1992), which were modified for this study. These measures were comprised of two environmental subscales, including the home (e.g., owning physical activity equipment) and the community (e.g., access to facilities in the community). Items for the home (9 items; see Table I.6) and community (6 items; see Table I.7) subscale employed 'Yes' or 'No' response options.

**Table I.6 - Physical Activity Home Physical Environment Items***

| |
|---|
| -Outdoor bicycle |
| -Skis/skates |
| -Weight training equipment |
| -Running / Walking shoes |
| -Pool |
| -Golf clubs |
| -Snow shoes |
| -Home exercise video |
| -Readings on physical activity and diabetes |

*Items correspond to questionnaire items G1 to G9 in Appendix II

**Table I.7 - Physical Activity Community Physical Environment Items***

| |
|---|
| -Jogging/Walking area |
| -Bicycle path/ bicycle area |
| -Swimming lap pool |
| -Recreation facility |
| -Golf course |
| -Ski trails, skating rink |

*Items correspond to questionnaire items H1 to H6 in Appendix II

## I.4 Data Screening

To minimize the possibility of statistical errors, a series of staged data screening procedures based on Tabachnick and Fidell (1989) were employed prior to the analyses (Table I.8).

**Table I.8 – Checklist for Screening Data**

1. Inspect univarite descriptive statistics for accuracy of input
    a) Out of range values
    b) Plausible means and standard deviations
    c) Coefficient of variations
2. Evaluate amount and distribution of missing data
3. Identify and deal with nonnormal variables
    a) Check skewness and kurtosis
    b) Transform variables if desirable
    c) Check results of transformation
4. Identify and deal with outliers
5. Check pairwise plots for nonlinearity and heteroscedascity
6. Evaluate variables for multicollinearity and singularity

The construction of the scales (i.e., five-point scales, agree/disagree, and yes/no scales) permitted only certain responses; data were within the appropriate ranges. The

means and standard deviations of the variables all appeared to be plausible. None of the correlations appeared to be overly inflated.

Missing data is a common challenge in research. Data may be missing for a variety of reasons, such as ambiguity or intrusiveness. The largest amount of missing data was in the social environment section (5 missing cases). To deal with this issue, a listwise deletion method was used. Since the analysis only involved two variables, this method was deemed appropriate. When participants responded to at least two-thirds of the items for a given construct, a mean score for the construct was estimated based on the completed responses for that specific construct (Plotnikoff, 1994). Generally, missing data appeared to be randomly distributed by cases and instrument sections.

Screening for data normality is an important step. Skewness and kurtosis was minimal for many of the constructs (Table I.9). Transformations are often recommended as a remedy for lack of normality (Tabachnick & Fidell, 1989). Energy expenditure was transformed by the square root criterion. However, analysis with the transformed value did not have a meaningful difference. It was decided to use the original untransformed version for subsequent analysis because the results of the transformed version were difficult to interpret.

**Table I.9 – Skewness and Kurtosis of the Variables**

| Variable | Skewness | Kurtosis |
|---|---|---|
| Self-efficacy | -0.12 | 0.57 |
| Observational Learning | -0.10 | -0.57 |
| Expectations – Positive | -0.47 | 0.61 |
| Expectations - Negative | -0.09 | -0.91 |

| | | |
|---|---|---|
| Environment - Social | -0.19 | -0.95 |
| Environment - Home | 1.08 | 0.46 |
| Environment - Community | 0.39 | -0.91 |
| Age | 0.51 | 0.14 |
| Disability | -0.27 | -1.27 |
| Total Energy Expenditure | 2.08 | 3.90 |
| Leisure Energy Expenditure | 2.37 | 4.70 |

Data were further screened to ensure there were no inconsistent observations. The origins of outliers are frequently generated as a result of natural variation of the population or a process one cannot control (Tabachnick & Fidell, 1989). To identify outliers, scatter plots of the dependent measures (i.e., energy expenditure, Canadian public health guidelines, and American public health guidelines) were produced. Upon examination of the energy expenditure distribution, one participant had an extreme value. To ensure this outlier was not due to human data entering error, the questionnaire was re-examined, and had been entered correctly. The participant had reported engaging in 16 one-hour bouts of hard activity in a day for eight days in the last two weeks. It seemed unlikely that this participant would be able to maintain such a high level of exertion over an extended period. This participant was therefore dropped from further analyses related to Aim Two.

Scatter plots of the independent versus the dependent variables demonstrated diverse levels of homoscedasticity. Those that demonstrated lower levels of homoscedasticity were not corrected because statistical test on normality tend to be overly conservative (Plotnikoff, 1994).

Multilinearity (correlation 0.90 and above) and singularity (perfect correlation) are issues that occur when variables are too highly correlated (Tabachnick & Fidell, 1989). Multilinearity and singularity may cause statistical problems. None of the correlations in our matrix were above 0.90 (except for the correlations between the dependent measures); therefore, multilinearity and singularity were not an issue.

## I.5 Data Analysis

### I.5.1 Pre Analysis

In order to combine Sample One and Sample Two, group differences in age, BMI, sex, marital status, customary occupation, and SCT constructs were tested. Chi-square tests and t-tests were conducted on these variables, and revealed no statistical differences ($p>.05$ level) between the two groups. Data from both samples were therefore combined to increase statistical power for subsequent qualitative and quantitative analysis.

### I.5.2 Research Aim One

A content analysis was completed in order to assess the attitudes and beliefs associated with physical activity. This process included both coding and categorizing patterns in the data (Mayan, 2001). The open-ended question was coded to identify consistent words, phrases, concepts or themes, and to simplify and organize the information. Once the coding was complete, the data were again extensively reviewed to categorize any underlying patterns.

### I.5.3 Research Aim Two

Participants' physical activity behaviour was examined by calculating energy expenditure from the self-reported physical activity behaviour measures on the questionnaire. Three energy expenditure scores were calculated: (1) leisure energy expenditure; (2) non-leisure energy expenditure (i.e., occupational/household); and (3) total energy expenditure (i.e., leisure and non-leisure). Minutes of activity performed at least at a moderate intensity were also calculated to assess public health guidelines.

### I.5.4 Research Aim Three

Bivariate correlations were conducted between age, gender, disability, and SCT variables with: (1) the three energy expenditure outcome assessments (i) leisure energy expenditure; (ii) non-leisure energy expenditure; and (iii) total energy expenditure; and (2), the two public heath guidelines dichotomously achieving or not: (i) Canadian physical activity public health recommendations of 120 minutes or more a week of moderate intensity activity (i.e., leisure activity and total activity), and (ii) the American physical activity public health recommendations of 150 minutes or more a week of moderate intensity activity (i.e., leisure activity and total activity).

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## APPENDIX II – QUESTIONNAIRES

*This appendix presents the administered questionnaire. Only the items used for this study are presented. Given thesis format guidelines, the questionnaire is not present in its original form.*

### Section A

This part of the questionnaire is needed to help understand the characteristics of the people participating in this study and is very important information. All information received is held in strict confidence and its presentation to the public will be group data only. If you do not know the answer to any question, or you do not wish to answer it, simply leave it blank and move to the next question. Please answer the following to the best of you knowledge.

1. Age _____ years

2. Male _____ Female _____

3. Marital Status Never Married _____ Married ____ Common Law ____
   Separated _____ Widowed ____ Divorced ____

4. Employment Status Homemaker _____ Retired _____
   Full Time Paid _____ Temporarily Unemployed _____
   Part-Time Paid _____ Volunteer _____

5. Height and Weight Information
   Weight in pounds ____ or in kilograms _____
   Height in feet/inches ____ or meters/centimetres _____

### Section B

1. What does physical activity mean to you? What does physical activity mean to those in your community, including the elders and children? What do neighbouring Aboriginal communities think of physical activity?

_____
_____
_____
_____
_____
_____
_____

## Section C

| *For Example:* | How many times in the past 2 weeks did you do the activity listed? | On average, how many minutes did you spend each time? | What usually happened to your heart rate or breathing when you did the activity? Did you have a small, moderate, or large increase, or no increase at all in your heart rate or breathing? | | | |
|---|---|---|---|---|---|---|
| | | **Minutes** | **None** | **Small** | **Medium** | **Large** |

**If you went swimming 3 times in the past 2 weeks for 45 minutes each time, you would respond this way**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Swimming | | | | | | | |
| Yes | ☑ → | __\|3 | __\|4\|5 | ☐ | ☐ | ☑ | ☐ |
| No | ☐ | | | | | | |

**If you did not swim in the past 2 weeks, check "no", and go on to the next activity / question.**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Swimming | | | | | | | |
| Yes | ☐ | __\|__ | __\|__\|__ | ☐ | ☐ | ☐ | ☐ |
| No | ☑ | | | | | | |
| 1. Walking for exercise | | | | | | | |
| Yes | ☐ → | __\|__ | __\|__\|__ | ☐ | ☐ | ☐ | ☐ |
| No | ☐ | | | | | | |
| 2. Exercise or aerobics classes | | | | | | | |
| Yes | ☐ → | __\|__ | __\|__\|__ | ☐ | ☐ | ☐ | ☐ |
| No | ☐ | | | | | | |
| 3. Swimming | | | | | | | |
| Yes | ☐ → | __\|__ | __\|__\|__ | ☐ | ☐ | ☐ | ☐ |
| No | ☐ | | | | | | |

| | How many times in the past 2 weeks did you do the activity listed? | On average, how many minutes did you spend each time? | What usually happened to your heart rate or breathing when you did the activity? Did you have a small, moderate, or large increase, or no increase at all in your heart rate or breathing? | | | |
|---|---|---|---|---|---|---|
| | | **Minutes** | **None** | **Small** | **Medium** | **Large** |
| 4. Dancing – popular, ballet, modern<br>Yes ☐ →<br>No ☐ | ___ | ___ | ☐ | ☐ | ☐ | ☐ |
| 5. Being physically active while playing with children *(other than the activities already mentioned)*<br>Yes ☐ →<br>No ☐ | ___ | ___ | ☐ | ☐ | ☐ | ☐ |
| 6. Housework<br>Yes ☐ →<br>No ☐ | ___ | ___ | ☐ | ☐ | ☐ | ☐ |
| 7. Yard work / shovelling snow<br>Yes ☐ →<br>No ☐ | ___ | ___ | ☐ | ☐ | ☐ | ☐ |
| 8. Other (specify):<br>_____ | ___ | ___ | ☐ | ☐ | ☐ | ☐ |
| 9. Other (specify):<br>_____ | ___ | ___ | ☐ | ☐ | ☐ | ☐ |

10. In the past month, was your participation in physical activities limited by a health condition, injury, or disability?

☐ No ☐ Yes If yes: How much did this limit you from getting physical activity?

| ***Slightly*** | ***A little*** | ***Somewhat*** | ***Quite a lot*** | ***Completely*** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**For the remaining sections in this study we ask about your beliefs and behaviours on doing *"regular physical activity"*.**

***"Regular physical activity"*** **is defined as doing activities such as brisk walking, recreation, and sporting activities all at a moderate intensity of a brisk walking pace. Moderate intensity does not have to mean huffing and puffing and sweating. These free-time activities do not include household chores or physical labour on the job.**

**For moderate activity to be regular, your activity must:**

- **add up to a total of 30 minutes or more per day**
- **be done at least 4 days per week**

**There are a number of ways that you could reach your 30 minute total. You could, for example:**

- **take a half-hour brisk walk or bicycle ride**

  **or**

- **take three, 10-minute periods of activities; such as a brisk walk for 10 minutes, swimming for 10 minutes, and climbing stairs for exercise for 10 minutes, all in the same day**

## Section D

**The next questions ask about the benefits of physical activity, and the steps that must be taken in order for those with diabetes to engage in physical activity.**

1. Regular physical activity is a part of your diabetes treatment.

   ☐ Agree ☐ Disagree

2. You're on a low-calorie diet. You can skip physical activity.

   ☐ Agree ☐ Disagree

3. Regular physical activity will lower your blood glucose control

   ☐ Agree ☐ Disagree

4. Regular physical activity does not provide health benefits for people with diabetes

   ☐ Agree ☐ Disagree

5. Because of my diabetes, I must take special precautions when participating in physical activity.

   ☐ Agree ☐ Disagree

## Section E

**The next questions ask how confident you are about doing regular physical activity in different circumstances. Please circle one response for each question.**

**In the next 6 months, I am confident that I can participate in regular physical activity:**

| | | *Not at all confident* | *Not very confident* | *Moderately confident* | *Very confident* | *Extremely confident* |
|---|---|---|---|---|---|---|
| 1. | When I am a little tired. | 1 | 2 | 3 | 4 | 5 |
| 2. | When I am in a bad mood or feeling depressed. | 1 | 2 | 3 | 4 | 5 |
| 3. | When I have to do it by myself. | 1 | 2 | 3 | 4 | 5 |
| 4. | When it becomes boring. | 1 | 2 | 3 | 4 | 5 |
| 5. | When I can't notice any improvements in my fitness. | 1 | 2 | 3 | 4 | 5 |

| | | *Not at all confident* | *Not very confident* | *Moderately confident* | *Very confident* | *Extremely confident* |
|---|---|---|---|---|---|---|
| 6. | When I have many other demands on my time. | 1 | 2 | 3 | 4 | 5 |
| 7. | When I feel a little stiff or sore. | 1 | 2 | 3 | 4 | 5 |
| 8. | When the weather is bad. | 1 | 2 | 3 | 4 | 5 |
| 9. | When I have to get up early, even on weekends. | 1 | 2 | 3 | 4 | 5 |
| 10. | When I have diabetes complications. | 1 | 2 | 3 | 4 | 5 |
| 11. | When I have to find different activities due to diabetes complications. | 1 | 2 | 3 | 4 | 5 |
| 12. | When I feel a little ill. | 1 | 2 | 3 | 4 | 5 |
| 13. | When I have to let others know I have diabetes. | 1 | 2 | 3 | 4 | 5 |

## Section F

**To what extent will the following ideas influence your decision to do regular physical activity over the next 6 months?**

*Remember, we are not asking you how much you agree or disagree with these statements, but rather how much each may influence your decision to do regular physical activity over the* ***next 6 months:***

| | **Over the next 6 months:** | *Not at all* | *A little* | *Somewhat* | *Quite a lot* | *Very much* |
|---|---|---|---|---|---|---|
| 1. | Physical activity would help me reduce tension or manage stress. | 1 | 2 | 3 | 4 | 5 |
| 2. | I would feel more confident about my health by getting regular physical activity. | 1 | 2 | 3 | 4 | 5 |
| 3. | I would sleep better. | 1 | 2 | 3 | 4 | 5 |
| 4. | Physical activity would take too much of my time. | 1 | 2 | 3 | 4 | 5 |
| 5. | I would have less time for my family and friends if I participated in physical activity. | 1 | 2 | 3 | 4 | 5 |
| 6. | I'd be too tired to get physical activity because of my other daily responsibilities. | 1 | 2 | 3 | 4 | 5 |
| 7. | Physical activity would help me have a more positive outlook. | 1 | 2 | 3 | 4 | 5 |

*Remember, we are not asking you how much you agree or disagree with these statements, but rather how much each may influence your decision to do regular physical activity over the* ***next 6 months:***

| | | | | | | |
|---|---|---|---|---|---|---|
| 8. | Physical activity would help me control my weight. | 1 | 2 | 3 | 4 | 5 |
| 9. | I'd worry about looking awkward if others saw me being physically active. | 1 | 2 | 3 | 4 | 5 |

| | **Over the next 6 months:** | *Not at all* | *A little* | *Somewhat* | *Quite a lot* | *Very much* |
|---|---|---|---|---|---|---|
| 10. | Participating in physical activity would cost too much money. | 1 | 2 | 3 | 4 | 5 |
| 11. | Regular physical activity would decrease my chances of having further diabetes complications. | 1 | 2 | 3 | 4 | 5 |
| 12. | Regular physical activity would help control my glucose level. | 1 | 2 | 3 | 4 | 5 |
| 13. | Regular physical activity would require that I monitor my blood glucose levels more closely. | 1 | 2 | 3 | 4 | 5 |
| 14. | Regular physical activity may lead to an insulin reaction. | 1 | 2 | 3 | 4 | 5 |
| 15. | Regular physical activity will require me to let others know I have diabetes. | 1 | 2 | 3 | 4 | 5 |
| 16. | Regular physical activity will require me to rely on others if complications occur. | 1 | 2 | 3 | 4 | 5 |
| 17. | Regular physical activity would cause me physical injury. | 1 | 2 | 3 | 4 | 5 |

## Section G

**This part of the questionnaire asks about things in your environment. What physical activity equipment, if any, do you own? (Check those that apply)**

| | | | |
|---|---|---|---|
| 1. | Outdoor Bicycle | ☐ Yes | ☐ No |
| 2. | Skis/ Skates | ☐ Yes | ☐ No |
| 3. | Weight training equipment | ☐ Yes | ☐ No |
| 4. | Running / Walking shoes | ☐ Yes | ☐ No |
| 5. | Physical activity centre | ☐ Yes | ☐ No |
| 6. | Golf Clubs | ☐ Yes | ☐ No |
| 7. | Snow shoes | ☐ Yes | ☐ No |
| 8. | Home exercise video (e.g., aerobics) | ☐ Yes | ☐ No |
| 9. | Readings on physical activity and diabetes | ☐ Yes | ☐ No |
| 10. | Other (specify): _____ | ☐ Yes | ☐ No |

## Section H

**Which of the following physical activity facilities do you consider to be convenient for you to access? (Check off all those that apply even if you don't use them)**

| | | | |
|---|---|---|---|
| 1. | Jogging/ Walking area | ☐ Yes | ☐ No |
| 2. | Bicycle path / Bicycle area | ☐ Yes | ☐ No |
| 3. | Swimming lap pool | ☐ Yes | ☐ No |
| 4. | Recreation facility | ☐ Yes | ☐ No |
| 5. | Physical activity centre | ☐ Yes | ☐ No |
| 6. | Ski trails, skating rink | ☐ Yes | ☐ No |
| 7. | Other (specify): _____ | ☐ Yes | ☐ No |
| 8. | Other (specify): _____ | ☐ Yes | ☐ No |

## Section I

**How often have you been motivated to participate in regular physical activity by:**

| | | *never* | *seldom* | *occasionally* | *often* | *very often* |
|---|---|---|---|---|---|---|
| 1. | Friends/acquaintances | 1 | 2 | 3 | 4 | 5 |
| 2. | Spouse / common-law | 1 | 2 | 3 | 4 | 5 |
| 3. | Family/Relatives | 1 | 2 | 3 | 4 | 5 |
| 4. | Children | 1 | 2 | 3 | 4 | 5 |
| 5. | Workplace | 1 | 2 | 3 | 4 | 5 |
| 6. | Others with diabetes | 1 | 2 | 3 | 4 | 5 |
| 7. | School | 1 | 2 | 3 | 4 | 5 |
| 8. | Community | 1 | 2 | 3 | 4 | 5 |
| 9. | Journal/Newspapers | 1 | 2 | 3 | 4 | 5 |
| 10. | TV/Radio | 1 | 2 | 3 | 4 | 5 |
| 11. | Health Center | 1 | 2 | 3 | 4 | 5 |
| 12. | Doctor | 1 | 2 | 3 | 4 | 5 |
| 13. | City/Town administrators | 1 | 2 | 3 | 4 | 5 |
| 14. | Neighbouring community | 1 | 2 | 3 | 4 | 5 |

## Section J

***How often do you see the following people doing physical activity?***

| | | *never* | *seldom* | *occasionally* | *often* | *very often* |
|---|---|---|---|---|---|---|
| 1. | Friends / acquaintances | 1 | 2 | 3 | 4 | 5 |
| 2. | Family/Relatives | 1 | 2 | 3 | 4 | 5 |
| 3. | Children | 1 | 2 | 3 | 4 | 5 |
| 4. | People in your neighbourhood | 1 | 2 | 3 | 4 | 5 |
| 5. | Community members | 1 | 2 | 3 | 4 | 5 |
| 6. | Other people with diabetes | 1 | 2 | 3 | 4 | 5 |
| 7. | Spouse | 1 | 2 | 3 | 4 | 5 |
| 8. | Neighbouring community | 1 | 2 | 3 | 4 | 5 |
| 9. | Your community | 1 | 2 | 3 | 4 | 5 |

**Study Consent Form**
**First Nations Exercise Study**

**Study title: Exercise behaviour of community adults with Type I and Type II Diabetes: A prospective examination of exercise determinants in a large population-based sample.**

Hello, my name is Stephanie Brunet and I'm a student from the University of Alberta. For several months I have been attending Angie's exercise classes on Tuesdays. In January, I asked members of band council for permission to come into your community to ask questions to community members like yourself who have diabetes. My professor and I are interested in finding out more about the physical activity rates and patterns of adults with diabetes who are living in Alberta. We are also interested in learning more about the reasons why they do, or do not, participate in physical activity regularly. The main reason for this research project is to increase the physical activity levels of those who have diabetes.

Your participation is very important to this project because diabetes is a growing health concern in communities across Canada and physical activity is very important in the prevention and treatment of diabetes. The questions I will ask today should take about 45 minutes. I will be coming out again in the fall to see if the role of physical activity in your life has changed. The questions will be about your health and physical activity. Is today a good time for you to answer my questions?

Your participation today is voluntary and any thing you say will be used only for research purposes in agreement with the Alberta Freedom of Information and Protection of Privacy Act. If there are any questions that you do not wish to answer, please let me know and we'll go on to the next question. You are free to stop at any time without consequence and your information will be removed from the study if you request this.

All information from our discussion today will be kept private. Codes, not personal names, are used in our computer files. Any information listing names, telephone numbers, or addresses will be destroyed following the completion of the project in (November 2002). Questionnaires will be stored in a locked filing cabinet and all answers will be listed in group format. Data are the property of my professor and myself and are normally kept for five years, after which time it is destroyed.

The health centre and band council will receive a summary of the results along with physical activity promotion recommendations at the end of the project. This may help to develop programs for those with diabetes in your community. Summary results will also be sent to the Canadian Diabetes Association. No individual names will be listed when reporting results.

Participant's name: _____

The respondent agrees to take part in this study. Yes_____ No_____

I believe that the person giving verbal consent understands what is involved in the study and voluntarily agrees to participate.

| _____ | _____ | _____ |
|---|---|---|
| Interviewer<br>(Please print name) | Signature | Date |